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BRAILLE TECHNICAL TABLES BANK CATALOG

1979

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## CONTENTS

25346  
 PAGE  
 iii .N23  
 iii 1979

INTRODUCTION .....	
HOW TO ORDER .....	
<b>1. PURE MATHEMATICS</b>	
Powers, Roots, Reciprocals .....	1
Logarithms, Antilogarithms .....	15
Exponential Functions .....	23
Hyperbolic Functions .....	31
Trigonometric Functions, Natural and Logarithmic .....	33
Numerical Analysis	
Factorials .....	53
Binomial Coefficients .....	56
<b>2. STATISTICS</b>	
Normal Curve, Areas, Ordinates .....	57
Binomial Distribution .....	67
Poisson Distribution .....	73
t Distribution .....	75
Chi-square Distribution .....	83
F Distribution .....	93
Correlation .....	105
Special Purpose Tests .....	113
Random Numbers .....	137
Regression and Least Squares .....	143
Ranges .....	147
Miscellaneous .....	155
<b>3. CHEMISTRY</b>	
Periodic Table of the Elements .....	161
Chemical Constants and Properties .....	162
<b>4. PHYSICS</b>	
Oceanology .....	171
<b>5. COMPUTER *</b>	
Symbols, Codes, Characters .....	173
<b>6. BUSINESS, FINANCE</b>	
Compound Interest .....	179
Compound Discount .....	185
Amount of Annuity .....	189
Present Value of Annuity .....	193
Mortality Statistics .....	198
<b>100. MISCELLANEOUS</b>	
Weights, Measures, Metric Conversions .....	199
Constants .....	207
Tables of Computation .....	209
Tables in English Braille	
Metric Conversions .....	211
Nutrition .....	213

\* Provisional Braille Code for Computer Notation 1972



## 1. PURE MATHEMATICS

### POWERS, ROOTS, AND RECIPROCALES

#### RECIPROCALES

##### 1.1.00246

Column headings are:  $n$ ,  $1/\sqrt{n}$ ;  $n$  ranges from 1 through 1000 at intervals of 1; entries under  $1/\sqrt{n}$  are tabulated to four decimal places; 23 pages.

$n$	$\frac{1}{\sqrt{n}}$
1	1.0000
2	.7071
3	.5774
4	.5000
5	.4472
6	.4082
7	.3780
8	.3536
9	.3333
10	.3162

996	.0317
997	.0317
998	.0317
999	.0316
1000	.0316

#### RECIPROCALES OF NUMBERS

##### 1.1.00253

Column headings are:  $n$ ,  $1000/n$ ;  $n$  ranges from 1 through 99 at intervals of 1; values of  $1000/n$  are tabulated to seven significant figures; 3 pages

$n$	$1,000/n$	$n$	$1,000/n$
1	1,000.000	50	20 000 00
2	500.000 0	51	19 607 84
3	333.333 3	52	19.230 77
4	250.000 0	53	18.867 92
		54	18.518 52

45	22.222 22	95	10.526 32
46	21.739 13	96	10.416 67
47	21.276 60	97	10.309 28
48	20.833 33	98	10.204 08
49	20.408 16	99	10.101 01

## SQUARE ROOTS

## 1.1.02042T

Column headings are:  $n$ ,  $\sqrt{n}$ ,  $\sqrt{10n}$ ; values of  $n$  are listed from 1.0 through 10.0 at intervals of 0.1; entries in the  $\sqrt{n}$  and  $\sqrt{10n}$  columns are to four decimal places; 3 pages.

$n$	$\sqrt{n}$	$\sqrt{10n}$	$n$	$\sqrt{n}$	$\sqrt{10n}$
1.0	1.0000	3.1623	5.5	2.3452	7.4162
1.1	1.0488	3.3166	5.6	2.3664	7.4833
1.2	1.0954	3.4641	5.7	2.3875	7.5498
1.3	1.1402	3.6056	5.8	2.4083	7.6158
1.4	1.1832	3.7417	5.9	2.4290	7.6811

5.0	2.2361	7.0711	9.5	3.0822	9.7468
5.1	2.2583	7.1414	9.6	3.0984	9.7980
5.2	2.2804	7.2111	9.7	3.1145	9.8489
5.3	2.3022	7.2801	9.8	3.1305	9.8995
5.4	2.3238	7.3485	9.9	3.1464	9.9499
5.5	2.3452	7.4162	10.0	3.1623	10.0000

## SQUARE ROOTS

## 1.1.02045H

Column headings are:  $x$ ,  $\sqrt{x}$ ,  $\sqrt{10x}$ ; values of  $x$  are from 0.01 through 5.00 at intervals of 0.01; entries in the  $\sqrt{x}$  and  $\sqrt{10x}$  columns are listed to four decimal places; 17 pages.

$x$	$\sqrt{x}$	$\sqrt{10x}$
0.01	0.1000	0.3162
0.02	0.1414	0.4472
0.03	0.1732	0.5477
0.04	0.2000	0.6325
0.05	0.2236	0.7071
0.06	0.2449	0.7746
0.07	0.2646	0.8367
0.08	0.2828	0.8944

4.96	2.2271	7.0427
4.97	2.2293	7.0498
4.98	2.2316	7.0569
4.99	2.2338	7.0640
5.00	2.2361	7.0711

## SQUARE ROOTS

### 1.1.02053T

Column headings are:  $n$ ,  $\sqrt{n}$ ,  $\sqrt{10n}$ ; values of  $n$  are listed from 1.0 through 10.0 at intervals of 0.1; entries in the  $\sqrt{n}$  and  $\sqrt{10n}$  columns are to five decimal places; 3 pages.

$n$	$\sqrt{n}$	$\sqrt{10n}$	$n$	$\sqrt{n}$	$\sqrt{10n}$
1.0	1.00000	3.16228	5.0	2.23607	7.07107
1.1	1.04881	3.31662	5.1	2.25832	7.14143
1.2	1.09545	3.46410	5.2	2.28035	7.21110
1.3	1.14018	3.60555	5.3	2.30217	7.28011
1.4	1.18322	3.74166	5.4	2.32379	7.34847
9.0	3.00000	9.48683	9.6	3.09839	9.79796
9.1	3.01662	9.53939	9.7	3.11448	9.84886
9.2	3.03315	9.59168	9.8	3.13050	9.89949
9.3	3.04959	9.64365	9.9	3.14643	9.94987
9.4	3.06594	9.69536	10.0	3.16228	10.0000
9.5	3.08221	9.74679			

## TABLE OF SQUARES AND SQUARE ROOTS

### 1.1.03024

Column headings are:  $N$ ,  $N^2$ ,  $\sqrt{N}$ ; values of  $N$  range from 1 through 150 at intervals of 1; values of  $N^2$  are exact; values of  $\sqrt{N}$  are listed to two decimal places; 5 pages.

$N$	$N^2$	$\sqrt{N}$	$N$	$N^2$	$\sqrt{N}$	$N$	$N^2$	$\sqrt{N}$
1	1	1.00	51	2601	7.14	101	10,201	10.05
2	4	1.41	52	2704	7.21	102	10,404	10.10
3	9	1.73	53	2809	7.28	103	10,609	10.15
4	16	2.00	54	2916	7.35	104	10,816	10.20
5	25	2.24	55	3025	7.42	105	11,025	10.25
46	2116	6.78	96	9216	9.80	146	21,316	12.08
47	2209	6.86	97	9409	9.85	147	21,609	12.12
48	2304	6.93	98	9604	9.90	148	21,904	12.17
49	2401	7.00	99	9801	9.95	149	22,201	12.21
50	2500	7.07	100	10,000	10.00	150	22,500	12.25

## SQUARES AND SQUARE ROOTS

1.1.03036

Column headings are:  $N$ ,  $N^2$ ,  $\sqrt{N}$ , row headings (under  $N$ ) range from 1 through 1000; entries under  $N^2$  are exact; entries under  $\sqrt{N}$  are tabulated to three decimal places; 34 pages.

$N$	$N^2$	$\sqrt{N}$	$N$	$N^2$	$\sqrt{N}$
1	1	1.000	31	9 61	5.568
2	4	1.414	32	10 24	5.657
3	9	1.732	33	10 89	5.745
4	16	2.000	34	11 56	5.831
5	25	2.236	35	12 25	5.916
.6	36	2.449	36	12 96	6.000
7	49	2.646	37	13 69	6.083
8	64	2.828	38	14 44	6.164
9	81	3.000	39	15 21	6.245
10	1 00	3.162	40	16 00	6.325
<hr/>					
976	95 25 76	31.241	996	99 20 16	31.559
977	95 45 29	31.257	997	99 40 09	31.575
978	95 64 84	31.273	998	99 60 04	31.591
979	95 84 41	31.289	999	99 80 01	31.607
980	96 04 00	31.305	1000	100 00 00	31.623

1.1.03036 (part)  $N$ , 1 through 100; 4 pages $N$ , 1 through 150; 5 pages $N$ , 1 through 200; 7 pages

## SQUARES, SQUARE ROOTS, AND PRIME FACTORS

### 1.1.03133

Column headings are: No., Sq., Sq. Root, Prime Factors; row headings under No. range from 1 through 100 at intervals of 1; entries in the column Sq. are exact; entries in Sq. Root column are tabulated to three decimal places; entries in the Prime Factors column are tabulated as products of powers of primes; 7 pages.

No.	Sq.	Sq. Root	Prime Factors	No.	Sq.	Sq. Root	Prime Factors
1	1	1.000		51	2,601	7.141	3·17
2	4	1.414	2	52	2,704	7.211	2 <sup>2</sup> ·13
3	9	1.732	3	53	2,809	7.280	53
4	16	2.000	2 <sup>2</sup>	54	2,916	7.348	2·3 <sup>3</sup>
5	25	2.236	5	55	3,025	7.416	5·11
6	36	2.449	2·3	56	3,136	7.483	2 <sup>3</sup> ·7
7	49	2.646	7	57	3,249	7.550	3·19
8	64	2.828	2 <sup>3</sup>	58	3,364	7.616	2·29
9	81	3.000	3 <sup>2</sup>	59	3,481	7.681	59
10	100	3.162	2·5	60	3,600	7.746	2 <sup>2</sup> ·3·5

46	2,116	6.782	2·23	96	9,216	9.798	2 <sup>6</sup> ·3
47	2,209	6.856	47	97	9,409	9.849	97
48	2,304	6.928	2 <sup>4</sup> ·3	98	9,604	9.899	2·7 <sup>2</sup>
49	2,401	7.000	7 <sup>2</sup>	99	9,801	9.950	3 <sup>2</sup> ·11
50	2,500	7.071	2·5 <sup>2</sup>	100	10,000	10.000	2 <sup>3</sup> ·5 <sup>2</sup>

## TABLE OF SQUARES, SQUARE ROOTS, AND RECIPROCALES

### 1.1.03266

Column headings are: N, N<sup>2</sup>,  $\sqrt{N}$ , 1/N; row headings under N range from 1 through 1000 at intervals of 1; values of N<sup>2</sup> are exact; entries are tabulated under  $\sqrt{N}$  to four decimal places; values of 1/N are tabulated to six significant figures in the range 1 through 10, to five significant figures in the range 11 through 100, and to eight significant figures in the range 101 through 1000; 67 pages..

N	N <sup>2</sup>	$\sqrt{N}$	1/N	N	N <sup>2</sup>	$\sqrt{N}$	1/N
1	1	1.0000	1.000000	41	1681	6.4031	.024390
2	4	1.4142	.500000	42	1764	6.4807	.023810
3	9	1.7321	.333333	43	1849	6.5574	.023256
4	16	2.0000	.250000	44	1936	6.6332	.022727
5	25	2.2361	.200000	45	2025	6.7082	.022222

96	9216	9.7980	.010417	136	18496	11.6619	.00735294
97	9409	9.8489	.010309	137	18769	11.7047	.00729927
98	9604	9.8995	.010204	138	19044	11.7473	.00724638
99	9801	9.9499	.010101	139	19321	11.7898	.00719424
100	10000	10.0000	.010000	140	19600	11.8322	.00714286

976	952576	31.2410	.00102459	996	992016	31.5595	.00100402
977	954529	31.2570	.00102354	997	994009	31.53	.00100301
978	956484	31.2730	.00102249	998	996004	31.5911	.00100200
979	958441	31.2890	.00102145	999	998001	31.6070	.00100100
980	960400	31.3050	.00102041	1000	1000000	31.6228	.00100000

## SQUARES, SQUARE ROOTS, AND RECIPROCALS OF NUMBERS 1-1000

## 1.1.03466

Column headings are:  $n$ ,  $n^2$ ,  $\sqrt{n}$ ,  $1/n$ ;  $n$  ranges from 1 through 1000 at intervals of 1; entries under  $\sqrt{n}$  and  $1/\sqrt{n}$  are tabulated to four decimal places; entries under  $1/n$  are tabulated to six decimal places; reciprocals of  $\sqrt{n}$  are appended to or interleaved with table containing the other four columns; 100 pages.

A combination of 1.1.03266 and 1.1.00246

Special note: Print form described gives  $1/n$  to six decimal places throughout.

Actually, from 101-1000, entries are tabulated to eight decimal places. Also  $n$  (in headings) is capitalized.

$n$	$n^2$	$\sqrt{n}$	$\frac{1}{n}$	$\frac{1}{\sqrt{n}}$
1	1	1.0000	1.000000	1.0000
2	4	1.4142	.500000	.7071
3	9	1.7321	.333333	.5774
4	16	2.0000	.250000	.5000
5	25	2.2361	.200000	.4472
6	36	2.4495	.166667	.4082
7	49	2.6458	.142857	.3780
8	64	2.8284	.125000	.3536
9	81	3.0000	.111111	.3333
10	100	3.1623	.100000	.3162
11	121	3.3166	.090909	.3015
12	144	3.4641	.083333	.2887
13	169	3.6056	.076923	.2774
14	196	3.7417	.071429	.2673
15	225	3.8730	.066667	.2582
991	982081	31.4802	.001009	.0318
992	984064	31.4960	.001008	.0318
993	986049	31.5119	.001007	.0317
994	988036	31.5278	.001006	.0317
995	990025	31.5436	.001005	.0317
996	992016	31.5595	.001004	.0317
997	994009	31.5753	.001003	.0317
998	996004	31.5911	.001002	.0317
999	998001	31.6070	.001001	.0316
1000	1000000	31.6228	.001000	.0316

## SQUARES AND SQUARE ROOTS

### 1.1.04033

Column headings are:  $n$ ,  $n^2$ ,  $\sqrt{n}$ ,  $\sqrt{10n}$ ; row headings under  $n$  range from 1 through 100 at intervals of 1; entries under  $n^2$  are exact; entries under  $\sqrt{n}$  and  $\sqrt{10n}$  are tabulated to three decimal places; 8 pages.

$n$	$n^2$	$\sqrt{n}$	$\sqrt{10n}$	$n$	$n^2$	$\sqrt{n}$	$\sqrt{10n}$
1	1	1.000	3.162	51	2601	7.141	22.583
2	4	1.414	4.472	52	2704	7.211	22.804
3	9	1.732	5.477	53	2809	7.280	23.022
4	16	2.000	6.325	54	2916	7.343	23.238
5	25	2.236	7.071	55	3025	7.416	23.452
6	36	2.449	7.746	56	3136	7.483	23.664
7	49	2.646	8.367	57	3249	7.550	23.875
8	64	2.828	8.944	58	3364	7.616	24.083
9	81	3.000	9.487	59	3481	7.681	24.290
10	100	3.162	10.000	60	3600	7.746	24.495
46	2116	6.782	21.448	96	9216	9.798	30.984
47	2209	6.856	21.679	97	9409	9.849	31.145
48	2304	6.928	21.909	98	9604	9.899	31.305
49	2401	7.000	22.136	99	9801	9.950	31.464
50	2500	7.071	22.361	100	10000	10.000	31.623

## SQUARES AND SQUARE ROOTS

### 1.1.04033T

Column headings are:  $N$ ,  $N^2$ ,  $\sqrt{N}$ ,  $\sqrt{10N}$ ; row headings under  $N$  range from 1.0 through 10.0 at intervals of .1; entries under  $N^2$  are exact and are to two decimal places; entries of  $\sqrt{N}$  and  $\sqrt{10N}$  are tabulated to three decimal places; 6 pages.

$N$	$N^2$	$\sqrt{N}$	$\sqrt{10N}$	$N$	$N^2$	$\sqrt{N}$	$\sqrt{10N}$
1.0	1.00	1.000	3.162	5.5	30.25	2.345	7.416
1.1	1.21	1.049	3.317	5.6	31.36	2.366	7.483
1.2	1.44	1.095	3.464	5.7	32.49	2.387	7.550
1.3	1.69	1.140	3.606	5.8	33.64	2.408	7.616
1.4	1.96	1.183	3.742	5.9	34.81	2.429	7.681
1.5	2.25	1.225	3.873	6.0	36.00	2.449	7.746
5.0	25.00	2.236	7.071	9.5	90.25	3.082	9.747
5.1	26.01	2.258	7.141	9.6	92.16	3.098	9.798
5.2	27.04	2.280	7.211	9.7	94.09	3.114	9.849
5.3	28.09	2.302	7.280	9.8	96.04	3.130	9.899
5.4	29.16	2.324	7.348	9.9	98.01	3.146	9.950
5.5	30.25	2.345	7.416	10	100.00	3.162	10.000

## SQUARES AND SQUARE ROOTS

## 1.1.04055H

Column headings are:  $N$ ,  $N^2$ ,  $\sqrt{N}$ ,  $\sqrt{10N}$ ; row headings under  $N$  range from 1.00 through 10.00 at intervals of 0.01; entries in the  $N^2$  column are exact, and to four decimal places; entries in the  $\sqrt{N}$  and  $\sqrt{10N}$  columns are tabulated to five decimal places; 60 pages.

$N$	$N^2$	$\sqrt{N}$	$\sqrt{10N}$	$N$	$N^2$	$\sqrt{N}$	$\sqrt{10N}$
1.00	1.0000	1.00000	3.16228	1.50	2.2500	1.22474	3.87298
1.01	1.0201	1.00499	3.17805	1.51	2.2801	1.22882	3.88587
1.02	1.0404	1.00995	3.19374	1.52	2.3104	1.23288	3.89872
1.03	1.0609	1.01489	3.20936	1.53	2.3409	1.23693	3.91152
1.04	1.0816	1.01980	3.22490	1.54	2.3716	1.24097	3.92428
<hr/>							
9.45	89.3025	3.07409	9.72111	9.95	99.0025	3.15436	9.97497
9.46	89.4916	3.07571	9.72625	9.96	99.2016	3.15595	9.97998
9.47	89.6809	3.07734	9.73139	9.97	99.4009	3.15753	9.98499
9.48	89.8704	3.07896	9.73653	9.98	99.6004	3.15911	9.98999
9.49	90.0601	3.08058	9.74166	9.99	99.8001	3.16070	9.99500
<hr/>							
			10.00	100.000	3.16228	10.00000	

## SQUARES AND SQUARE ROOTS

## 1.1.04065H

Column headings are:  $n$ ,  $n^2$ ,  $\sqrt{n}$ ,  $\sqrt{10n}$ ; row headings under  $n$  range from 1.00 through 9.99 at intervals of 0.01; entries under  $n^2$  are exact, and to four decimal places; entries in the  $\sqrt{n}$  and  $\sqrt{10n}$  columns are tabulated to six decimal places; 60 pages.

$n$	$n^2$	$\sqrt{n}$	$\sqrt{10n}$	$n$	$n^2$	$\sqrt{n}$	$\sqrt{10n}$
1.00	1.0000	1.000000	3.162278	1.50	2.2500	1.224745	3.872983
1.01	1.0201	1.004988	3.178050	1.51	2.2801	1.228821	3.885872
1.02	1.0404	1.009950	3.193744	1.52	2.3104	1.232883	3.898718
1.03	1.0609	1.014889	3.209361	1.53	2.3409	1.236932	3.911521
1.04	1.0816	1.019804	3.224903	1.54	2.3716	1.240967	3.924283
<hr/>							
9.45	89.3025	3.074085	9.721111	9.95	99.0025	3.154362	9.974969
9.46	89.4916	3.075711	9.726253	9.96	99.2016	3.155947	9.979980
9.47	89.6809	3.077337	9.731393	9.97	99.4009	3.157531	9.984989
9.48	89.8704	3.078961	9.736529	9.98	99.6004	3.159114	9.989995
9.49	90.0601	3.080584	9.741663	9.99	99.8001	3.160698	9.994999

## POWERS AND ROOTS

### 1.1.04066

Column headings are:  $N$ ,  $N^2$ ,  $\sqrt{N}$ ,  $\sqrt{10N}$ ; row headings under  $N$  range from 1 through 1000 at intervals of 1; values of  $N^2$  are exact; entries under  $\sqrt{N}$  and  $\sqrt{10N}$  are tabulated to six significant figures; 67 pages.

$N$	$N^2$	$\sqrt{N}$	$\sqrt{10N}$
1	1	1.00 000	3.16 228
2	4	1.41 421	4.47 214
3	9	1.73 205	5.47 723
4	16	4.00 000	6.32 456
5	25	2.23 607	7.07 107

$N$	$N^2$	$\sqrt{N}$	$\sqrt{10N}$
50	2 500	7.07 107	22.36 07
51	2 601	7.14 143	22.58 32
52	2 704	7.21 110	22.80 35
53	2 809	7.28 011	23.02 17
54	2 916	7.34 8.7	23.23 79
55	3 025	7.41 620	23.45 21

946	894 916	30.75 71	97.26 25
947	896 809	30.77 34	97.31 39
948	898 704	30.78 96	97.36 53
949	900 601	30.80 58	97.41 66
950	902 500	30.82 21	97.46 79

$N$	$N^2$	$\sqrt{N}$	$\sqrt{10N}$

996	992 016	31.55 95	99.79 98
997	994 009	31.57 53	99.84 99
998	996 004	31.59 11	99.89 99
999	998 001	31.60 70	99.95 00
1000	1000 000	31.62 28	100.00 00

$N$	$N^2$	$\sqrt{N}$	$\sqrt{10N}$

## SQUARES AND SQUARE ROOTS

### 1.1.04076

Column headings are:  $n$ ,  $n^2$ ,  $\sqrt{n}$ ,  $\sqrt{10n}$ ; values or row headings under  $n$  range from 1 through 1000 at intervals of 1; values of  $n^2$  are exact; entries under  $\sqrt{n}$  and  $\sqrt{10n}$  are tabulated to seven significant figures; 67 pages.

$n$	$n^2$	$\sqrt{n}$	$\sqrt{10n}$	$n$	$n^2$	$\sqrt{n}$	$\sqrt{10n}$
1	1	1.000 000	3.162 278	30	900	5.477 226	17.32051
2	4	1.414 214	4.472 136	31	961	5.567 764	17.60682
3	9	1.732 051	5.477 226	32	1 024	5.656 854	17.88854
4	16	2.000 000	6.324 555	33	1 089	5.744 563	18.16590
5	25	2.236 068	7.071 068	34	1 156	5.830 952	18.43909
6	36	2.449 490	7.745 967	35	1 225	5.916 080	18.70829
7	49	2.645 751	8.366 600	36	1 296	6.000 000	18.97367
8	64	2.828 427	8.944 272	37	1 369	6.082 763	19.23538
9	81	3.000 000	9.486 833	38	1 444	6.164 414	19.49359

965	931 225	31.06445	98.23441	995	990 025	31.54362	99.74969
966	933 156	31.08054	98.28530	996	992 016	31.55947	99.79980
967	935 089	31.09662	98.33616	997	994 009	31.57531	99.84989
968	937 024	31.11270	98.38699	998	996 004	31.59114	99.89995
969	938 961	31.12876	98.43780	999	998 001	31.60696	99.94999

1000 1000 000 31.62278 100.00000

## SQUARES, SQUARE ROOTS, AND RECIPROCALS

1.1.04255H

Column headings are: N,  $N^2$ ,  $\sqrt{N}$ ,  $\sqrt{10N}$ ,  $1/N$ ; row headings or entries under N range from 1.00 through 10.00 at intervals of .01; entries in the  $N^2$  column are exact; entries in the  $\sqrt{N}$  and  $\sqrt{10N}$  columns are tabulated to five decimal places; 90 pages.

Reciprocals, under  $1/N$ , are appended to or interleaved with 1.1.04055H

N	$N^2$	$\sqrt{N}$	$\sqrt{10N}$	$1/N$	N	$N^2$	$\sqrt{N}$	$\sqrt{10N}$	$1/N$
1.00	1.0000	1.00000	3.16228	1.000000	1.50	2.2500	1.22474	3.87298	.666667
1.01	1.0201	1.00499	3.17805	.990099	1.51	2.2801	1.22882	3.88587	.662252
1.02	1.0404	1.00995	3.19374	.980392	1.52	2.3104	1.23288	3.89872	.657895
1.03	1.0609	1.01489	3.20936	.970874	1.53	2.3409	1.23693	3.91153	.653395
1.04	1.0816	1.01980	3.22490	.961538	1.54	2.3716	1.24097	3.92428	.649351
1.05	1.1025	1.02470	3.24037	.952381	1.55	2.4025	1.24499	3.93700	.645161
1.06	1.1236	1.02956	3.25576	.943396	1.56	2.4336	1.24900	3.94968	.641026
1.07	1.1449	1.03441	3.27109	.934579	1.57	2.4649	1.25300	3.96232	.636943
1.08	1.1664	1.03923	3.28634	.925926	1.58	2.4964	1.25698	3.97492	.632911
1.09	1.1881	1.04403	3.30151	.917431	1.59	2.5281	1.26095	3.98748	.628431
1.10	1.2100	1.04881	3.31662	.909091	1.60	2.5600	1.26491	4.00000	.625000
1.11	1.2321	1.05357	3.33167	.900901	1.61	2.5921	1.26886	4.01248	.621118
1.12	1.2544	1.05830	3.34664	.892857	1.62	2.6244	1.27279	4.02492	.617284
1.13	1.2769	1.06301	3.36155	.884956	1.63	2.6569	1.27671	4.03733	.613497
1.14	1.2996	1.06771	3.37639	.877193	1.64	2.6896	1.28062	4.04969	.609756
1.15	1.3225	1.07238	3.39116	.869565	1.65	2.7225	1.28452	4.06202	.606061
1.16	1.3456	1.07703	3.40588	.862069	1.66	2.7556	1.28841	4.07431	.602410
1.17	1.3689	1.08167	3.42053	.854701	1.67	2.7889	1.29228	4.08656	.598802
1.18	1.3924	1.08628	3.43511	.847458	1.68	2.8224	1.29615	4.09878	.595238
1.19	1.4161	1.09087	3.44964	.840336	1.69	2.8561	1.30000	4.11096	.591716
1.20	1.4400	1.09545	3.46410	.833333	1.70	2.8900	1.30384	4.12311	.588235
1.21	1.4641	1.10000	3.47851	.826446	1.71	2.9241	1.30767	4.13521	.584795
1.22	1.4884	1.10454	3.49285	.819672	1.72	2.9584	1.31149	4.14729	.581395
1.23	1.5129	1.10905	3.50714	.813008	1.73	2.9929	1.31529	4.15933	.578035
1.24	1.5376	1.11355	3.52136	.806452	1.74	3.0276	1.31909	4.17133	.574713

9.40	88.3600	3.06594	9.69536	.106383	9.90	98.0100	3.14643	9.94987	.101010
9.41	88.5481	3.06757	9.70052	.106270	9.91	98.2081	3.14802	9.95490	.100908
9.42	88.7364	3.06920	9.70567	.106157	9.92	98.4064	3.14960	9.95992	.100806
9.43	88.9249	3.07083	9.71082	.105045	9.93	98.6049	3.15119	9.96494	.100705
9.44	89.1136	3.07246	9.71597	.105932	9.94	98.8036	3.15278	9.96995	.100604
9.45	89.3025	3.07409	9.72111	.105820	9.95	99.0025	3.15436	9.97497	.100503
9.46	89.4916	3.07571	9.72625	.105708	9.96	99.2016	3.15595	9.97998	.100402
9.47	89.6809	3.07734	9.73139	.105597	9.97	99.4009	3.15753	9.98499	.100301
9.48	89.8704	3.07896	9.73653	.105485	9.98	99.6004	3.15911	9.98999	.100200
9.49	90.0601	3.08058	9.74166	.105374	9.99	99.8001	3.16070	9.99500	.100100
9.50	90.2500	3.08221	9.74679	.105263	10.00	100.000	3.16228	10.00000	.100000

## SQUARES, SQUARE ROOTS, AND RECIPROCALS

### 1.1.04256

Column headings are: N,  $N^2$ ,  $\sqrt{N}$ ,  $\sqrt{10N}$ ,  $1000/N$ ; values of N range from 1 through 999 at intervals of 1; values of  $N^2$  are exact; entries in the remaining three columns are tabulated to five significant figures; 67 pages.

N	$N^2$	$\sqrt{N}$	$\sqrt{10N}$	$1000/N$	N	$N^2$	$\sqrt{N}$	$\sqrt{10N}$	$1000/N$
1	1	1.0000	3.1623	1000.0	30	.900	5.4772	17.321	33.333
2	4	1.4142	4.4721	500.00	31	961	5.5678	17.607	32.258
3	9	1.7321	5.4772	333.33	32	1 024	5.6569	17.889	31.250
4	16	2.0000	6.3246	250.00	33	1 089	5.7446	18.166	30.303
5	25	2.2361	7.0711	200.00	34	1 156	5.8310	18.439	29.412
6	36	2.4495	7.7460	166.67	35	1 225	5.9161	18.708	28.571
7	49	2.6458	8.3666	142.86	36	1 296	6.0000	18.974	27.778
8	64	2.8284	8.9443	125.00	37	1 369	6.0828	19.235	27.027
9	81	3.0000	9.4868	111.11	38	1 444	6.1644	19.494	26.316
					39	1 521	6.2450	19.748	25.641
975	950 625	31.225	98.742	1.0256	995	990 025	31.544	99.750	1.0050
976	952 576	31.241	98.793	1.0246	996	992 016	31.559	99.800	1.0040
977	954 529	31.257	98.843	1.0235	997	994 009	31.575	99.850	1.0030
978	956 484	31.273	98.894	1.0225	998	996 004	31.591	99.900	1.0020
979	958 441	31.289	98.944	1.0215	999	998 001	31.607	99.950	1.0010

## TABLE OF POWERS AND ROOTS

### 1.1.33033

Column headings are: n,  $n^2$ ,  $\sqrt{n}$ ,  $n^3$ ,  $\sqrt[3]{n}$ ; row headings or values under n range from 1 through 100 at intervals of 1; entries in the  $n^2$  and  $n^3$  columns are exact; entries in the  $\sqrt{n}$  and  $\sqrt[3]{n}$  columns are tabulated to three decimal places; 7 pages.

n	$n^2$	$\sqrt{n}$	$n^3$	$\sqrt[3]{n}$	n	$n^2$	$\sqrt{n}$	$n^3$	$\sqrt[3]{n}$
1	1	1.000	1	1.000	51	2,601	7.141	132,651	3.708
2	4	1.414	8	1.260	52	2,704	7.211	140,608	3.733
3	9	1.732	27	1.442	53	2,809	7.280	148,877	3.756
4	16	2.000	64	1.587	54	2,916	7.348	157,464	3.780
5	25	2.236	125	1.710	55	3,025	7.416	166,375	3.803
6	36	2.449	216	1.817	56	3,136	7.483	175,616	3.826
7	49	2.646	343	1.913	57	3,249	7.550	185,193	3.848
8	64	2.828	512	2.000	58	3,364	7.616	195,112	3.871
9	81	3.000	729	2.080	59	3,481	7.681	205,379	3.893
10	100	3.162	1,000	2.154	60	3,600	7.746	216,000	3.915
46	2,116	6.782	97,336	3.583	96	9,216	9.798	884,736	4.579
47	2,209	6.856	103,823	3.609	97	9,409	9.849	912,673	4.595
48	2,304	6.928	110,592	3.634	98	9,604	9.899	941,192	4.610
49	2,401	7.000	117,649	3.659	99	9,801	9.950	970,299	4.626
50	2,500	7.071	125,000	3.684	100	10,000	10.000	1,000,000	4.642

## POWERS AND ROOTS

## 1.1.33043

Column headings are:  $n$ ,  $n^2$ ,  $\sqrt{n}$ ,  $n^3$ ,  $\sqrt[3]{n}$ ; values of  $n$  are tabulated from 1 through 100 at intervals of 1; entries in  $n^2$  and  $n^3$  columns are exact; entries in  $\sqrt{n}$  and  $\sqrt[3]{n}$  columns are tabulated to four decimal places; 7 pages.

$n$	$n^2$	$\sqrt{n}$	$n^3$	$\sqrt[3]{n}$	$n$	$n^2$	$n^3$	$\sqrt{n}$	$n^2$	$\sqrt[3]{n}$
1	1	1.0000	1	1.0000	51	2,601	7,1414	132,651	132,651	3.7084
2	4	1.4142	8	1.2599	52	2,704	7.2111	140,608	140,608	3.7325
3	9	1.7321	27	1.4423	53	2,809	7.2801	148,877	148,877	3.7563
4	16	2.0000	64	1.5874	54	2,916	7.3485	157,464	157,464	3.7798
5	25	2.2361	125	1.7100	55	3,025	7.4162	166,375	166,375	3.8030

46	2,116	6.7823	97,336	3.5830	96	9,216	9.7980	884,736	884,736	4.5700
47	2,209	6.8557	103,823	3.6088	97	9,409	9.8489	912,673	912,673	4.5947
48	2,304	6.9282	110,592	3.6342	98	9,604	9.8995	941,192	941,192	4.6184
49	2,401	7.0000	117,649	3.6593	99	9,801	9.9499	970,299	970,299	4.6461
50	2,500	7.0711	125,000	3.6840	100	10,000	10.0000	1,000,000	1,000,000	4.6461

## SQUARES, CUBES, SQUARE ROOTS, AND CUBE ROOTS

## 1.1.33063

Column headings are:  $n$ ,  $n^2$ ,  $n^3$ ,  $\sqrt{n}$ ,  $\sqrt[3]{n}$ ; values of  $n$  range from 1 through 99 at intervals of 1; entries in  $n^2$  and  $n^3$  columns are exact; entries in the remaining two columns are tabulated to six decimal places; 7 pages.

$n$	$n^2$	$n^3$	$\sqrt{n}$	$\sqrt[3]{n}$	$n$	$n^2$	$n^3$	$\sqrt{n}$	$\sqrt[3]{n}$
1	1	1	1.000 000	1.000 000	50	2,500	125,000	7.071 068	3.684 031
2	4	8	1.414 214	1.259 921	51	2,601	132,651	7.141 428	3.708 430
3	9	27	1.732 051	1.442 250	52	2,704	140,608	7.211 103	3.732 511
4	16	64	2,000 000	1.587 401	53	2,809	148,877	7.280 110	3.756 286
					54	2,916	157,464	7.348 469	3.779 763
5	25	125	2.236 068	1.709 976	55	3,025	166,375	7.416 198	3.802 952
6	36	216	2.449 490	1.817 121	56	3,136	175,616	7.483 315	3.825 862
7	49	343	2.645 751	1.912 931	57	3,249	185,193	7.549 834	3.848 501
8	64	512	2.828 427	2.000 000	58	3,364	195,112	7.615 773	3.870 877
9	81	729	3.000 000	2.080 048	59	3,481	205,379	7.681 146	3.892 996

45	2,025	91,125	6.708 204	3.556 893	95	9,025	857,375	9.746 974	4.562 903
46	2,116	97,336	6.782 330	3.583 048	96	9,216	884,736	9.797 959	4.578 857
47	2,209	103,823	6.855 655	3.608 826	97	9,409	912,673	9,848 858	4,594 701
48	2,304	110,592	6.928 203	3.634 241	98	9,604	941,192	9,899 495	4,610 436
49	2,401	117,649	7.000 000	3.659 306	99	9,801	970,299	9,949 874	4,626 065

## POWERS, ROOTS, AND RECIPROCALES

### 1.1.33243

Column headings are:  $n$ ,  $n^2$ ,  $n^3$ ,  $\sqrt{n}$ ,  $\sqrt[3]{n}$ ,  $1/n$ ; row headings, under  $n$ , range from 1 through 100 at intervals of 1; entries in the  $n^2$  and  $n^3$  columns are exact; entries in the  $\sqrt{n}$  and  $\sqrt[3]{n}$  columns are tabulated to three decimal places; entries in the  $1/n$  column are tabulated to four decimal places; 7 pages.

$n$	$n^2$	$n^3$	$\sqrt{n}$	$\sqrt[3]{n}$	$\frac{1}{n}$	$n$	$n^2$	$n^3$	$\sqrt{n}$	$\sqrt[3]{n}$	$\frac{1}{n}$
1	1	1	1.000	1.000	1.0000	51	2,601	132,651	7.141	3.708	.0196
2	4	8	1.414	1.260	.5000	52	2,704	140,608	7.211	3.733	.0192
3	9	27	1.732	1.442	.3333	53	2,809	148,877	7.280	3.756	.0189
4	16	64	2.000	1.587	.2500	54	2,916	157,464	7.348	3.780	.0185
5	25	125	2.236	1.710	.2000	55	3,025	166,375	7.416	3.803	.0182
46	2,116	97,336	6.782	3.583	.0217	96	9,216	884,736	9.798	4.579	.0104
47	2,209	103,823	6.856	3.609	.0213	97	9,409	912,673	9.849	4.595	.0103
48	2,304	110,592	6.928	3.634	.0208	98	9,604	941,192	9.899	4.610	.0102
49	2,401	117,649	7.000	3.659	.0204	99	9,801	970,299	9.950	4.626	.0101
50	2,500	125,000	7.071	3.684	.0200	100	10,000	1,000,000	10.000	4.642	.0100

## CUBES AND CUBE ROOTS

### 1.1.40033F

Column headings are:  $N$ ,  $N^3$ ,  $\sqrt[3]{N}$ ,  $\sqrt[3]{10N}$ ,  $\sqrt[3]{100N}$ ; row headings under  $N$  are 1.0 through 10 at intervals of .1; all other entries are tabulated to three decimal places; 6 pages.

$N$	$N^3$	$\sqrt[3]{N}$	$\sqrt[3]{10N}$	$\sqrt[3]{100N}$	$N$	$N^3$	$\sqrt[3]{N}$	$\sqrt[3]{10N}$	$\sqrt[3]{100N}$
1.0	1.000	1.000	2.154	4.642	5.5	166.375	1.765	3.803	8.193
1.1	1.331	1.032	2.224	4.791	5.6	175.616	1.776	3.826	8.243
1.2	1.728	1.063	2.289	4.932	5.7	185.193	1.786	3.849	8.291
1.3	2.197	1.091	2.351	5.066	5.8	195.112	1.797	3.871	8.340
1.4	2.744	1.119	2.410	5.192	5.9	205.379	1.807	3.893	8.387
1.5	3.375	1.145	2.466	5.313	6.0	216.000	1.817	3.915	8.434
1.6	4.096	1.170	2.520	5.429	6.1	226.981	1.827	3.936	8.481
1.7	4.913	1.193	2.571	5.540	6.2	238.328	1.837	3.958	8.527
1.8	5.832	1.216	2.621	5.646	6.3	250.047	1.847	3.979	8.573
1.9	6.859	1.239	2.668	5.749	6.4	262.144	1.857	4.000	8.618
5.0	125.000	1.710	3.684	7.937	9.5	857.375	2.118	4.563	9.830
5.1	132.651	1.721	3.708	7.990	9.6	884.736	2.125	4.579	9.865
5.2	140.608	1.732	3.733	8.041	9.7	912.673	2.133	4.595	9.899
5.3	148.877	1.744	3.756	8.093	9.8	941.192	2.140	4.610	9.933
5.4	157.464	1.754	3.780	8.143	9.9	970.299	2.147	4.626	9.967
5.5	166.375	1.765	3.803	8.193	10	1000.000	2.154	4.642	10.000

## SQUARES, CUBES, SQUARE ROOTS, AND CUBE ROOTS

## 1.1.44076

Column headings are:  $n$ ,  $n^2$ ,  $n^3$ ,  $\sqrt{n}$ ,  $\sqrt{10n}$ ,  $\sqrt[3]{n}$ ,  $\sqrt[3]{10n}$ ,  $\sqrt[3]{100n}$ ; row headings or values of  $n$  range from 1 through 999 at intervals of 1; values of  $n^2$  and  $n^3$  are exact; entries in the remaining columns are tabulated to seven significant figures; 100 pages

$n$	$n^2$	$n^3$	$\sqrt{n}$	$\sqrt{10n}$	$\sqrt[3]{n}$	$\sqrt[3]{10n}$	$\sqrt[3]{100n}$
1	1	1	1.000 000	3.162 278	1.000 000	2.154 435	4.641 589
2	4	8	1.414 214	4.472 136	1.259 921	2.714 418	5.848 035
3	9	27	1.732 051	5.477 226	1.442 250	3.107 233	6.694 330
4	16	64	2.000 000	6.324 555	1.587 401	3.419 952	7.368 063
5	25	125	2.236 068	7.071 068	1.709 976	3.684 031	7.937 005
6	36	216	2.449 490	7.745 967	1.817 121	3.914 868	8.434 327
7	49	343	2.645 751	8.366 600	1.912 931	4.121 285	8.879 040
8	64	512	2.828 427	8.944 272	2.000 000	4.308 869	9.283 178
9	81	729	3.000 000	9.486 833	2.080 084	4.481 405	9.654 894
10	100	1 000	3.162 278	10.000 00	2.154 435	4.641 589	10.000 00
11	121	1 331	3.316 625	10.488 09	2.223 980	4.791 420	10.322 80
12	144	1 728	3.464 102	10.954 45	2.289 428	4.932 424	10.626 59
13	169	2 197	3.605 551	11.401 75	2.351 335	5.065 797	10.913 93
14	196	2 744	3.741 657	11.832 16	2.410 142	5.192 494	11.186 89
990	980 100	970 299 000	31.464 27	99.498 74	9.966 555	21.472 29	46.260 65
991	982 081	973 242 271	31.480 15	99.548 98	9.969 910	21.479 52	46.276 22
992	984 064	976 191 488	31.496 03	99.599 20	9.973 262	21.486 74	46.291 78
993	986 049	979 146 657	31.511 90	99.649 39	9.976 612	21.493 96	46.307 33
994	988 036	982 107 784	31.527 77	99.699 55	9.979 960	21.501 17	46.322 87
995	990 025	985 074 875	31.543 62	99.749 69	9.983 305	21.508 38	46.338 40
996	992 016	988 047 936	31.559 47	99.799 80	9.986 649	21.515 58	46.353 92
997	994 009	991 026 973	31.575 31	99.849 89	9.989 990	21.522 78	46.369 43
998	996 004	994 011 992	31.591 14	99.899 95	9.993 329	21.529 97	46.384 92
999	998 001	997 002 999	31.606 96	99.949 99	9.996 666	21.537 16	46.400 41

## DIGIT SEQUENCES FOR SQUARE ROOTS

## 1.1.100

This table has no column headings; leftmost column of each group of three columns lists values from 100 through 999 at intervals of 1; the second and third columns contain four-digit sequences representing square roots of values in left column, as well as square roots of ten times those values; decimal points are omitted and must be determined by inspection; 15 pages.

100	1000	3162	150	1225	3873	200	1414	4472
101	1005	3178	151	1229	3886	201	1418	4483
102	1010	3194	152	1233	3899	202	1421	4494
103	1015	3209	153	1237	3912	203	1425	4506
104	1020	3225	154	1241	3924	204	1428	4517
895	2992	9460	945	3074	9721	995	3154	9975
896	2993	9466	946	3076	9726	996	3156	9980
897	2995	9471	947	3077	9731	997	3158	9985
898	2997	9476	948	3079	9737	998	3159	9990
899	2998	9482	949	3081	9742	999	3161	9995

## LOGARITHMS, ANTILOGARITHMS

## LOGARITHMS (Common)

1.2.1430

Row headings under N range from 10 through 99 at intervals of 1; column headings range from 0 through 9; mantissas are to four places; 12 pages.

N	0	1	2	3	4	5	6	7	8	9
10	0000	0043	0086	0128	0170	0212	0253	0294	0334	0374
11	0414	0453	0492	0531	0569	0607	0645	0682	0719	0755
12	0792	0828	0864	0899	0934	0969	1004	1038	1072	1106
13	1139	1173	1206	1239	1271	1303	1335	1367	1399	1430
14	1461	1492	1523	1553	1584	1614	1644	1673	1703	1732
15	1761	1790	1818	1847	1875	1903	1931	1959	1987	2014
16	2041	2068	2095	2122	2148	2175	2201	2227	2253	2279
17	2304	2330	2355	2380	2405	2430	2455	2480	2504	2529

95	9777	9782	9786	9791	9795	9800	9805	9809	9814	9818
96	9823	9827	9832	9836	9841	9845	9850	9854	9859	9863
97	9868	9872	9877	9881	9886	9890	9894	9899	9903	9908
98	9912	9917	9921	9926	9930	9934	9939	9943	9948	9952
99	9956	9961	9965	9969	9974	9978	9983	9987	9991	9996

## LOGARITHMS (Common)

1.2.1430P

Row headings range from 10 through 99 at intervals of 1; column headings are 0 through 9; mantissas are to four places; in addition, a tabulation shows proportional parts which share the row headings of the basic table; its column headings are 1 through 9; proportional parts are one- or two-digit values; 18 pages.

N	Mantissas					Proportional Parts													
	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
10	0000	0043	0086	0128	0170	0212	0253	0294	0334	0374	*4	8	12	17	21	25	29	33	37
11	0414	0453	0492	0531	0569	0607	0645	0682	0719	0755	4	8	11	15	19	23	26	30	34
12	0792	0828	0864	0899	0934	0969	1004	1038	1072	1106	3	7	10	14	17	21	24	28	31
13	1139	1173	1206	1239	1271	1303	1335	1367	1399	1430	3	6	10	13	16	19	23	26	29
14	1461	1492	1523	1553	1584	1614	1644	1673	1703	1732	3	6	9	12	15	18	21	24	27
15	1761	1790	1818	1847	1875	1903	1931	1959	1987	2014	*3	6	8	11	14	17	20	22	25
16	2041	2068	2095	2122	2148	2175	2201	2227	2253	2279	3	5	8	11	13	16	18	21	24
17	2304	2330	2355	2380	2405	2430	2455	2480	2504	2529	2	5	7	10	12	15	17	20	22
18	2553	2577	2601	2625	2648	2672	2695	2718	2742	2765	2	5	7	9	12	14	16	19	21
19	2788	2810	2833	2856	2878	2900	2923	2945	2967	2989	2	4	7	9	11	13	16	18	20

95	9777	9782	9786	9791	9795	9800	9805	9809	9814	9818	0	1	1	2	2	3	3	4	4
96	9823	9827	9832	9836	9841	9845	9850	9854	9859	9863	0	1	1	2	2	3	3	4	4
97	9868	9872	9877	9881	9886	9890	9894	9899	9903	9908	0	1	1	2	2	3	3	4	4
98	9912	9917	9921	9926	9930	9934	9939	9943	9948	9952	0	1	1	2	2	3	3	4	4
99	9956	9961	9965	9969	9974	9978	9983	9987	9991	9996	0	1	1	2	2	3	3	4	4
N	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

## LOGARITHMS (Common)

1.2.1431

Row headings are: 0 through 99 at intervals of 1; column headings are: 0 through 9 at like intervals; mantissas are tabulated to four places; 14 pages.

N	0	1	2	3	4	5	6	7	8	9
0	0000	3010	4771	6021	6990	7782	8451	9031	9542	
1	0000	0414	0792	1139	1461	1761	2041	2304	2553	2788
2	3010	3222	3424	3617	3802	3979	4150	4314	4472	4624
3	4771	4914	5051	5185	5315	5441	5563	5682	5798	5911
4	6021	6128	6232	6335	6435	6532	6628	6721	6812	6902
5	6990	7076	7160	7243	7324	7404	7482	7559	7634	7709
6	7782	7853	7924	7993	8062	8129	8195	8261	8325	8388
7	8451	8513	8573	8633	8692	8751	8808	8865	8921	8976
8	9031	9085	9138	9191	9243	9294	9345	9395	9445	9494
9	9542	9590	9638	9685	9731	9777	9823	9868	9912	9956
10	0000	0043	0086	0128	0170	0212	0253	0294	0334	0374
11	0414	0453	0492	0531	0569	0607	0645	0682	0719	0755
12	0792	0828	0864	0899	0934	0969	1004	1038	1072	1106
13	1139	1173	1206	1239	1271	1303	1335	1367	1399	1430
14	1461	1492	1523	1553	1584	1614	1644	1673	1703	1732
15	1761	1790	1818	1847	1875	1903	1931	1959	1987	2014
16	2041	2068	2095	2122	2148	2175	2201	2227	2253	2279
17	2304	2330	2355	2380	2405	2430	2455	2480	2504	2529
18	2553	2577	2601	2625	2648	2672	2695	2718	2742	2765
19	2788	2810	2833	2856	2878	2900	2923	2945	2967	2989
20	3010	3032	3054	3075	3096	3118	3139	3160	3181	3201
21	3222	3243	3263	3284	3304	3324	3345	3365	3385	3404

90	9542	9547	9552	9557	9562	9566	9571	9576	9581	9586
91	9590	9595	9600	9605	9609	9614	9619	9624	9628	9633
92	9638	9643	9647	9652	9657	9661	9666	9671	9675	9680
93	9685	9689	9694	9699	9703	9708	9713	9717	9722	9727
94	9731	9736	9741	9745	9750	9754	9759	9763	9768	9773
95	9777	9782	9786	9791	9795	9800	9805	9809	9814	9818
96	9823	9827	9832	9836	9841	9845	9850	9854	9859	9863
97	9868	9872	9877	9881	9886	9890	9894	9899	9903	9908
98	9912	9917	9921	9926	9930	9934	9939	9943	9948	9952
99	9956	9961	9965	9969	9974	9978	9983	9987	9991	9996

## LOGARITHMS (Common)

1.2.1431P

Row headings are: 0 through 9 at intervals of 1; column headings are: 0 through 99 at like intervals; in addition, a tabulation shows proportional parts which share the row headings of the basic table; its column headings are: 1 through 9; proportional parts are one- or two-digit entries; 20 pages.

## SIX-PLACE MANTISSAS FOR COMMON LOGARITHMS

### 1.2.1640

Row headings are: 100 through 1000 at intervals of 1; column headings are: 0 through 9 at like intervals; mantissas are to six places; 120 pages (2 volumes).

N	0	1	2	3	4	5	6	7	8	9
100	00 0000	0434	0868	1301	1734	2166	2598	3029	3461	3891
01	4321	4751	5181	5609	6038	6466	6894	7321	7748	8174
02	00 8600	9026	9451	9876	*0300	*0724	*1147	*1570	*1993	*2415
03	01 2837	3259	3680	4100	4521	4940	5360	5779	6197	6616
04	01 7033	7451	7868	8284	8700	9116	9532	9947	*0361	*0775
05	00 1880	163	2016	2428	2841	3254	3664	4075	4486	4896
94	3727	3815	3903	3991	4078	4166	4254	4342	4430	4517
95	4605	4693	4781	4868	4956	5044	5131	5219	5307	5394
96	5482	5569	5657	5744	5832	5919	6007	6094	6182	6269
97	6356	6444	6531	6618	6706	6793	6880	6968	7055	7142
98	7229	7317	7404	7491	7578	7665	7752	7839	7926	8014
99	8101	8188	8275	8362	8449	8535	8622	8709	8796	8883
500	69 8970	9057	9144	9231	9317	9404	9491	9578	9664	9751
96	8259	8303	8347	8390	8434	8477	8521	8564	8608	8652
97	8695	8739	8782	8826	8869	8913	8956	9000	9043	9087
98	9131	9174	9218	9261	9305	9348	9392	9435	9479	9522
99	99 9565	9609	9652	9696	9739	9783	9826	9870	9913	9957
1000	00 0000	0043	0087	0130	0174	0217	0260	0304	0347	0391
N	0	1	2	3	4	5	6	7	8	9

## ANTILOGARITHMS

### 1.2.2431P

Row headings are: .00 through .99 at intervals of .01; column headings are: 0 through 9 at intervals of 1; entries are to four places; the proportional parts share the row headings of the basic table; its column headings are: 1 through 9; proportional parts are one- or two digit values; 21 pages.

	0	1	2	3	4	5	6	7	8	9	Proportional Parts								
											1	2	3	4	5	6	7	8	9
.00	1000	1002	1005	1007	1009	1012	1014	1016	1019	1021	0	0	1	1	1	1	2	2	2
.01	1023	1026	1028	1030	1033	1035	1038	1040	1042	1045	0	0	1	1	1	1	2	2	2
.02	1047	1050	1052	1054	1057	1059	1062	1064	1067	1069	0	0	1	1	1	1	2	2	2
.03	1072	1074	1076	1079	1081	1084	1086	1089	1091	1094	0	0	1	1	1	1	2	2	2
.04	1096	1099	1102	1104	1107	1109	1112	1114	1117	1119	0	1	1	1	1	2	2	2	2
.95	8913	8933	8954	8974	8995	9016	9036	9057	9078	9099	2	4	6	8	10	12	15	17	19
.96	9120	9141	9162	9183	9204	9226	9247	9268	9290	9311	2	4	6	8	11	13	15	17	19
.97	9333	9354	9376	9397	9419	9441	9462	9484	9506	9528	2	4	7	9	11	13	15	17	20
.98	9550	9572	9594	9616	9638	9661	9683	9705	9727	9750	2	4	7	9	11	13	16	18	20
.99	9772	9795	9817	9840	9863	9886	9908	9931	9954	9977	2	5	7	9	11	14	16	18	20
	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9

## NATURAL LOGARITHMS TO BASE e

## 1.2.3320

Row headings under N range from 1 through 10 at intervals of 1; column headings are .0 through .9 at intervals of .1; entries are tabulated to three decimal places; 2 pages.

N	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
1	0.000	0.095	0.182	0.262	0.336	0.405	0.470	0.531	0.588	0.642
2	0.693	0.742	0.788	0.833	0.875	0.916	0.956	0.993	1.030	1.065
3	1.099	1.131	1.163	1.194	1.224	1.253	1.281	1.308	1.335	1.361
4	1.386	1.411	1.435	1.459	1.482	1.504	1.526	1.548	1.569	1.589
5	1.609	1.629	1.649	1.668	1.686	1.705	1.723	1.740	1.758	1.775
8	2.079	2.092	2.104	2.116	2.128	2.140	2.152	2.163	2.175	2.186
9	2.197	2.208	2.219	2.230	2.241	2.251	2.262	2.272	2.282	2.293
10	2.303	2.313	2.322	2.332	2.342	2.351	2.361	2.370	2.380	2.389

## NATURAL LOGS

## 1.2.3330

Column headings are: x and log x; x ranges from 0.1 through 9.9 at intervals of .1 and from 10 through 100 at intervals of 10; entries are tabulated to three decimal places; 3 pages.

x	log x	x	log x	x	log x
0.1	-2.303	4.0	1.386	8.0	2.079
0.2	-1.609	4.1	1.411	8.1	2.092
0.3	-1.204	4.2	1.435	8.2	2.104
0.4	-0.916	4.3	1.459	8.3	2.116
0.5	-0.693	4.4	1.482	8.4	2.128
0.6	-0.511	4.5	1.504	8.5	2.140
		4.6	1.526	8.6	2.152
2.0	0.693	6.0	1.792	10	2.303
2.1	0.742	6.1	1.808	20	2.996
2.2	0.788	6.2	1.825	30	3.401
2.3	0.833	6.3	1.841	40	3.689
2.4	0.875	6.4	1.856	50	3.912
2.5	0.916	6.5	1.872	60	4.094
2.6	0.956	6.6	1.887	70	4.248
2.7	0.993	6.7	1.902	80	4.382
2.8	1.030	6.8	1.917	90	4.500
2.9	1.065	6.9	1.932	100	4.605

## NATURAL LOGARITHMS OF NUMBERS

1.2.3422

Column headings are:  $N$ ,  $\ln N$ ,  $\ln \frac{1}{10} N$ ,  $\ln \frac{1}{100} N$ ; row headings under  $N$  range from 0 through 100 at intervals of 1; entries are tabulated to four decimal places; 7 pages.

$N$	$\ln N$	$\ln \frac{1}{10} N$	$\ln \frac{1}{100} N$	$N$	$\ln N$	$\ln \frac{1}{10} N$	$\ln \frac{1}{100} N$
0	—	—	—	50	3.9120	1.6094	-0.6931
1	0.0000	-2.3026	-4.6052	51	3.9318	1.6292	-0.6733
2	0.6931	-1.6094	-3.9120	52	3.9512	1.6487	-0.6539
3	1.0986	-1.2040	-3.5066	53	3.9703	1.6677	-0.6349
4	1.3863	-0.9163	-3.2189	54	3.9890	1.6864	-0.6162
5	1.6094	-0.6931	-2.9957	55	4.0073	1.7047	-0.5978
6	1.7918	-0.5108	-2.8134	56	4.0254	1.7228	-0.5798
46	3.8286	1.5261	-0.7765	96	4.5643	2.2618	-0.0408
47	3.8501	1.5476	-0.7550	97	4.5747	2.2721	-0.0305
48	3.8712	1.5686	-0.7340	98	4.5850	2.2824	-0.0202
49	3.8918	1.5892	-0.7133	99	4.5951	2.2925	-0.0101
50	3.9120	1.6094	-0.6931	100	4.6052	2.3026	0.0000

## NATURAL LOGARITHMS

1.2.3430

Row headings range from 1.0 through 9.9 at intervals of .1; column headings are .00 through .09; entries are tabulated to four decimal places; 12 pages.

	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
1.0	0.0000	0.0100	0.0198	0.0296	0.0392	0.0488	0.0583	0.0677	0.0770	0.0862
1.1	.0953	.1044	.1133	.1222	.1310	.1398	.1484	.1570	.1655	.1740
1.2	.1823	.1906	.1989	.2070	.2151	.2231	.2311	.2390	.2469	.2546
1.3	.2624	.2700	.2776	.2852	.2927	.3001	.3075	.3148	.3221	.3293
1.4	.3365	.3436	.3507	.3577	.3646	.3716	.3784	.3853	.3920	.3988
1.5	.4055	.4121	.4187	.4253	.4318	.4383	.4447	.4511	.4574	.4637
9.4	.2407	.2418	.2428	.2439	.2450	.2460	.2471	.2481	.2492	.2502
9.5	.2513	.2523	.2534	.2544	.2555	.2565	.2576	.2586	.2597	.2607
9.6	.2618	.2628	.2638	.2649	.2659	.2670	.2680	.2690	.2701	.2711
9.7	.2721	.2732	.2742	.2752	.2762	.2773	.2783	.2793	.2803	.2814
9.8	.2824	.2834	.2844	.2854	.2865	.2875	.2885	.2895	.2905	.2915
9.9	2.2925	2.2935	2.2946	2.2956	2.2966	2.2976	2.2986	2.2996	2.3006	2.3016

## NATURAL LOGARITHMS OF NUMBERS

1.2.3432

Column headings are:  $n$  and  $\log_e n$ ; row headings under  $n$  range from 0.1 through 10 at intervals of .1, from 10 through 20 at intervals of 1, and from 20 through 215 at intervals of 5; entries are tabulated to four decimal places; 4 pages.

$n$	$\log_e n$	$n$	$\log_e n$	$n$	$\log_e n$
0.1	7.6974	5.0	1.6094	10	2.3026
0.2	8.3906	5.1	1.6292	11	2.3979
0.3	8.7960	5.2	1.6487	12	2.4849
0.4	9.0837	5.3	1.6677	13	2.5649
		5.4	1.6864	14	2.6391
0.5	9.3069	5.5	1.7047	15	2.7081
0.6	9.4892	5.6	1.7228	16	2.7726
0.7	9.6433	5.7	1.7405	17	2.8332
0.8	9.7769	5.8	1.7579	18	2.8904
0.9	9.8946	5.9	1.7750	19	2.9444
1.0	0.0000	6.0	1.7918	20	2.9957
1.1	0.0953	6.1	1.8083	25	3.2189
1.2	0.1823	6.2	1.8245	30	3.4012
1.3	0.2624	6.3	1.8405	35	3.5553
1.4	0.3365	6.4	1.8563	40	3.6889
1.5	0.4055	6.5	1.8718	45	3.8067
1.6	0.4700	6.6	1.8871	50	3.9120
1.7	0.5306	6.7	1.9021	55	4.0073
1.8	0.5878	6.8	1.9169	60	4.0943
1.9	0.6419	6.9	1.9315	65	4.1744
2.0	0.6931	7.0	1.9459	70	4.2485
2.1	0.7419	7.1	1.9601	75	4.3175
2.2	0.7885	7.2	1.9741	80	4.3820

4.0	1.3863	9.0	2.1972	170	5.1358
4.1	1.4110	9.1	2.2083	175	5.1648
4.2	1.4351	9.2	2.2192	180	5.1930
4.3	1.4586	9.3	2.2300	185	5.2204
4.4	1.4816	9.4	2.2407	190	5.2470
4.5	1.5041	9.5	2.2513	195	5.2730
4.6	1.5261	9.6	2.2618	200	5.2983
4.7	1.5476	9.7	2.2721	205	5.3230
4.8	1.5686	9.8	2.2824	210	5.3471
4.9	1.5892	9.9	2.2925	215	5.3706

\* Subtract 10 for  $n < 1$ . Thus  $\log_e 0.1 = 7.6974 - 10 = -2.3026$ .

Braille version of table lists first nine entries as follows:

- 2.3026
- 1.6094
- 1.2040
- 0.9163
- 0.6931
- 0.5108
- 0.3567
- 0.2231
- 0.1054

## NATURAL LOGARITHM FUNCTION

## 1.2.3510

Column headings are  $x$  and  $\ln x$ ;  $x$  ranges from .01 through 1.50 at intervals of .01 and from 1.50 through 3.00 at intervals of .10; entries are to five decimal places; 4 pages.

$x$	$\ln x$	$x$	$\ln x$	$x$	$\ln x$	$x$	$\ln x$
.01	-4.60517	0.50	-0.69315	1.00	0.00000	1.5	0.4 0547
.02	-3.91202	.51	.67334	1.01	.00995	1.6	7000
.03	.50656	.52	.65393	1.02	.01980	1.7	6.3 3063
.04	.21888	.53	.63488	1.03	.02956	1.8	8779
		.54	.61619	1.04	.03922	1.9	0.6 4185
.05	-2.99573	.55	.59784	1.05	.04879	2.0	9315
.06	.81341	.56	.57982	1.06	.05827	2.1	0.7 4194
.07	.65926	.57	.56212	1.07	.06766	2.2	8846
.08	.52573	.58	.54473	1.08	.07696	2.3	0.8 3291
.09	.40795	.59	.52763	1.09	.08618	2.4	7547
0.10	-2.30259	0.60	-0.51083	1.10	.09531	2.5	0.9 1629
.11	.20727	.61	.49430	1.11	.10436	2.6	5551
.12	.12026	.62	.47804	1.12	.11333	2.7	9325
.13	.04022	.63	.46204	1.13	.12222	2.8	1.0 2962
.14	-1.96611	.64	.44629	1.14	.13103	2.9	6471
.15	.89712	.65	.43078	1.15	.13976	3.0	9861
.16	.83258	.66	.41552	1.16	.14842		
.17	.77196	.67	.40048	1.17	.15700		
.18	.71480	.68	.38566	1.18	.16551		
.19	.66073	.69	.37106	1.19	.17395		
0.20	-1.60944	0.70	-0.35667	1.20	.18232		
.21	.56065	.71	.34249	1.21	.19062		
.22	.51413	.72	.32850	1.22	.19885		
.23	.46968	.73	.31471	1.23	.20701		
.24	.42712	.74	.30111	1.24	.21511		
.25	.38629	.75	.28768	1.25	.22314		
.26	.34707	.76	.27444	1.26	.23111		
.27	.30933	.77	.26136	1.27	.23902		
.28	.27297	.78	.24846	1.28	.24686		
.29	.23787	.79	.23572	1.29	.25464		
0.30	-1.20397	0.80	-0.22314	1.30	.26236		
.31	.17118	.81	.21072	1.31	.27003		
.32	.13943	.82	.19845	1.32	.27763		
.33	.10866	.83	.18633	1.33	.28518		
.34	.07881	.84	.17435	1.34	.29267		
.35	-1.04982	.85	-0.16252	1.35	.30010		
.36	.02165	.86	.15032	1.36	.30748		
.37	-0.99425	.87	.13926	1.37	.31481		
.38	.96758	.88	.12783	1.38	.32208		
.39	.94161	.89	.11653	1.39	.32930		
0.40	-0.91629	0.90	-0.10536	1.40	.33647		
.41	.89160	.91	.09431	1.41	.34359		
.42	.86750	.92	.08338	1.42	.35066		
.43	.84397	.93	.07257	1.43	.35767		
.44	.82098	.94	.06188	1.44	.36464		
.45	.79851	.95	.05129	1.45	.37156		
.46	.77653	.96	.04082	1.46	.37844		
.47	.75402	.97	.03046	1.47	.38536		

## NATURAL LOGARITHMS OF NUMBERS BETWEEN 1.0 AND 4.99

## 1.2.3530

Column headings are: N, 0 through 9 at intervals of 1; row headings under N range from 1.0 through 4.9 at intervals of .1; entries are tabulated to five decimal places; 9 pages.

N	0	1	2	3	4		5	6	7	8	9
1.0	0.00000	.00995	.01980	.02956	.03922		.04879	.05827	.06766	.07698	.08618
.1	.09531	.10436	.11333	.12222	.13103		.13976	.14842	.15700	.16551	.17395
.2	.18232	.19062	.19855	.20701	.21511		.22314	.23111	.23902	.24686	.25464
.3	.26236	.27003	.27763	.28518	.29267		.30010	.30748	.31481	.32208	.32930
.4	.33647	.34359	.35066	.35767	.36464		.37156	.37844	.38526	.39204	.39878
.5	.40547	.41211	.41871	.42527	.43178		.43825	.44469	.45108	.45742	.46373
4.4	.48160	.48387	.48614	.48840	.49065		.49290	.49515	.49739	.49962	.50185
.5	.50408	.50630	.50851	.51072	.51293		.51513	.51732	.51951	.52170	.52388
.6	.52606	.52823	.53039	.53256	.53471		.53687	.53902	.54116	.54330	.54543
.7	.54756	.54969	.55181	.55393	.55604		.55814	.56025	.56235	.56444	.56653
.8	.56862	.57070	.57277	.57485	.57691		.57898	.58104	.58309	.58515	.58719
.9	.58924	.59127	.59331	.59534	.59737		.59939	.60141	.60342	.60543	.60744

## NATURAL OR NAPIERIAN LOGARITHMS (5.0 through 9.99)

## 1.2.3530A

Column headings are: N, 0 through 9 at intervals of 1; row headings under N range from 5.0 through 9.9 at intervals of .1; entries are tabulated to five decimal places; 10 pages.

x	0	1	2	3	4	5	6	7	8	9
5.0	1.60944	1.61144	1.61343	1.61542	1.61741	1.61939	1.62137	1.62334	1.62531	1.62728
5.1	1.62924	1.63120	1.63315	1.63511	1.63705	1.63900	1.64094	1.64287	1.64481	1.64673
5.2	1.64866	1.65058	1.65250	1.65441	1.65632	1.65823	1.66013	1.66203	1.66393	1.66582
5.3	1.66771	1.66959	1.67147	1.67335	1.67523	1.67710	1.67895	1.68083	1.68269	1.68455
5.4	1.68640	1.68825	1.69010	1.69194	1.69378	1.69562	1.69745	1.69928	1.70111	1.70293
5.5	1.70475	1.70656	1.70838	1.71019	1.71199	1.71380	1.71560	1.71740	1.71919	1.72098
5.6	1.72277	1.72455	1.72633	1.72811	1.72988	1.73166	1.73342	1.73519	1.73695	1.73871
9.0	2.19722	2.19834	2.19944	2.20055	2.20166	2.20276	2.20387	2.20497	2.20607	2.20717
9.1	2.20827	2.20937	2.21047	2.21157	2.21266	2.21375	2.21485	2.21594	2.21703	2.21812
9.2	2.21920	2.22029	2.22138	2.22246	2.22354	2.22462	2.22570	2.22678	2.22786	2.22894
9.3	2.23001	2.23109	2.23216	2.23324	2.23431	2.23538	2.23645	2.23751	2.23858	2.23965
9.4	2.24071	2.24177	2.24284	2.24390	2.24496	2.24601	2.24707	2.24813	2.24918	2.25024
9.5	2.25129	2.25234	2.25339	2.25444	2.25549	2.25654	2.25759	2.25863	2.25968	2.26072
9.6	2.26176	2.26280	2.26384	2.26488	2.26592	2.26696	2.26799	2.26903	2.27006	2.27109
9.7	2.27213	2.27316	2.27419	2.27521	2.27624	2.27727	2.27829	2.27932	2.28034	2.28136
9.8	2.28238	2.28340	2.28442	2.28544	2.28646	2.28747	2.28849	2.28950	2.29051	2.29152
9.9	2.29253	2.29354	2.29455	2.29556	2.29657	2.29757	2.29858	2.29958	2.30058	2.30158

## EXPONENTIAL FUNCTIONS

### THE EXPONENTIAL FUNCTION TO BASE 10

#### 1.3.0403

Row headings are listed from .00 through .99 at intervals of .01; column headings are: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9; entries are to four places; 14 pages.

	0	1	2	3	4	5	6	7	8	9
.00	1000	1002	1005	1007	1009	1012	1014	1016	1019	1021
.01	1023	1026	1028	1030	1033	1035	1038	1040	1042	1045
.02	1047	1050	1052	1054	1057	1059	1062	1064	1067	1069
.03	1072	1074	1076	1079	1081	1084	1086	1089	1091	1094
.04	1096	1099	1102	1104	1107	1109	1112	1114	1117	1119

.95	8913	8933	8954	8974	8995	9016	9036	9057	9078	9099
.96	9120	9141	9162	9183	9204	9226	9247	9268	9290	9311
.97	9333	9354	9376	9397	9419	9441	9462	9484	9506	9528
.98	9550	9572	9594	9616	9638	9661	9683	9705	9727	9750
.99	9772	9795	9817	9840	9863	9886	9908	9931	9954	9977

## EXPONENTIAL FUNCTIONS $e^x$

#### 1.3.0532

Row headings (under x) are listed from .0 through 4 at intervals of .1, and from 4 through 10 at intervals of 1; column headings are: x, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9; entries are tabulated to five significant figures; 9 pages.

x	0	1	2	3	4	5	6	7	8	9
.0	1.0000	1.0101	1.0202	1.0305	1.0408	1.0513	1.0618	1.0725	1.0833	1.0942
.1	1.1052	1.1163	1.1275	1.1388	1.1503	1.1618	1.1735	1.1853	1.1972	1.2092
.2	1.2214	1.2337	1.2461	1.2586	1.2712	1.2840	1.2969	1.3100	1.3231	1.3364
.3	1.3499	1.3634	1.3771	1.3910	1.4049	1.4191	1.4333	1.4477	1.4623	1.4770
.4	1.4918	1.5068	1.5220	1.5373	1.5527	1.5683	1.5841	1.6000	1.6161	1.6323
.5	1.6487	1.6653	1.6820	1.6989	1.7160	1.7333	1.7507	1.7683	1.7860	1.8040

4.	54.598	60.340	66.686	73.700	81.451	90.017	99.484	109.95	121.51	134.29
5.	148.41	164.02	181.27	200.34	221.41	244.69	270.43	298.87	330.30	365.04
6.	403.43	445.86	492.75	544.57	601.85	665.14	735.10	812.41	897.85	992.27
7.	1096.6	1212.0	1339.4	1480.3	1636.0	1808.0	1998.2	2208.3	2440.6	2697.3
8.	2981.0	3294.5	3641.0	4023.9	4447.1	4914.8	5431.7	6002.9	6634.2	7332.0
9.	8103.1	8955.3	9897.1	10938	12088	13360	14765	16318	18034	19930
10.	22026									

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EXPONENTIAL FUNCTIONS  $e^{-x}$ 

## 1.3.1532

Row headings (under x) are listed from .0 through 4 at intervals of .1, from 4 through 10 at intervals of 1; all entries through row 3.9 are tabulated to five decimal places, with a larger number being contained in rows 4 through 10; 11 pages.

x	0	1	2	3	4	5	6	7	8	9
.0	1.00000	.99005	.98020	.97045	.96079	.95123	.94176	.93239	.92312	.91393
.1	.90484	.89583	.88692	.87810	.86936	.86061	.85214	.84366	.83527	.82696
.2	.81873	.81058	.80252	.79453	.78663	.77880	.77105	.76338	.75578	.74826
.3	.74082	.73345	.72615	.71892	.71177	.70469	.69768	.69073	.68386	.67706
.4	.67032	.66365	.65705	.65051	.64404	.63763	.63128	.62500	.61878	.61263
.5	.60653	.60050	.59452	.58860	.58275	.57695	.57121	.56553	.55990	.55433
.6	.54881	.54335	.53794	.53250	.52779	.52205	.51685	.51171	.50667	.50158

3.9	.0204	.0204	.01984	.0196	.0195	.0125	.0100	.0087	.01865	.018
4.	.018316	.016573	.014996	.013569	.012277	.011109	.010052	.009053	.0082297	.0074466
5.	.0067379	.0060967	.0055166	.0049916	.0045166	.0040868	.0036979	.0033460	.0030276	.0027394
6.	.0024788	.0022429	.0020294	.0018363	.0016616	.0015034	.0013604	.0012309	.0011138	.0010078
7.	.0091188	.0082510	.0074659	.0067554	.0061125	.0055308	.0050045	.0045283	.0040973	.0037074
8.	.0033546	.0030354	.0027465	.0024852	.0022487	.0020347	.0018411	.0016659	.0015073	.0013639
9.	.0012341	.0011167	.0010104	.0091424	.0082724	.0074852	.0067729	.0061283	.0055452	.0050175
10.	.0045400									

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## EXPONENTIAL FUNCTIONS

## 1.3.3532

Column headings are: x and  $e^x$ ; x ranges from 0.00 through 5.50 at intervals of .01, and from 5.50 through 8.00 at intervals of .05; entries are tabulated to five significant figures; 14 pages.

x	$e^x$	x	$e^x$	x	$e^x$	x	$e^x$
0.00	1.0000	0.50	1.6487	1.00	2.7163	1.50	4.4817
0.01	1.0101	0.51	1.6653	1.01	2.7456	1.51	4.5267
0.02	1.0202	0.52	1.6820	1.02	2.7732	1.52	4.5722
0.03	1.0305	0.53	1.6989	1.03	2.8011	1.53	4.6182
0.04	1.0408	0.54	1.7160	1.04	2.8292	1.54	4.6646

4.45	85.627	4.95	141.17	5.45	232.76	7.75	2321.6
4.46	86.488	4.96	142.59	5.46	235.10	7.80	2440.6
4.47	87.357	4.97	144.03	5.47	237.46	7.85	2565.7
4.48	88.235	4.98	145.47	5.48	239.85	7.90	2697.3
4.49	89.121	4.99	146.94	5.49	242.26	7.95	2835.6
4.50	90.017	5.00	148.41	5.50	244.69	8.00	2981.0

## NEGATIVE EXPONENTIAL FUNCTION

1.3.4321

Column headings are:  $x$ ,  $e^{-x}$ ; row headings under  $x$  range from 0 through 4.0 at intervals of .1; from 4.0 through 5.0 at intervals of .5; from 5.0 through 7.0 at intervals of 1; entries under  $e^{-x}$  are tabulated to three decimal places; 1 page.

$x$	$e^{-x}$	$x$	$e^{-x}$	$x$	$e^{-x}$
0	1.000	1.5	.223	3.0	.050
.1	.905	1.6	.202	3.1	.045
.2	.819	1.7	.183	3.2	.041
.3	.741	1.8	.165	3.3	.037
.4	.670	1.9	.150	3.4	.033
.5	.607	2.0	.135	3.5	.030

.8	.449	2.3	.100	3.8	.022
.9	.407	2.4	.091	3.9	.020
1.0	.368	2.5	.082	4.0	.018
1.1	.333	2.6	.074	4.5	.011
1.2	.301	2.7	.067	5.0	.007
1.3	.273	2.8	.061	6.0	.002
1.4	.247	2.9	.055	7.0	.001

VALUES OF  $e^{-x}$ 

1.3.4531

Column headings are:  $x$ ,  $e^{-x}$ ; row headings under  $x$  range from 0.0 through 9.9 at intervals of .1; entries under  $e^{-x}$  are to three decimal places in the range 0.0 through 4.9; to four decimal places in the range 5.0 through 7.4; to five decimal places in the range 7.5 through 9.9; 3 pages.

$x$	$e^{-x}$	$x$	$e^{-x}$	$x$	$e^{-x}$	$x$	$e^{-x}$
0.0	1.000	2.5	0.082	5.0	0.0067	7.5	0.00055
0.1	0.905	2.6	0.074	5.1	0.0061	7.6	0.00050
0.2	0.819	2.7	0.067	5.2	0.0055	7.7	0.00045
0.3	0.741	2.8	0.061	5.3	0.0050	7.8	0.00041
0.4	0.670	2.9	0.055	5.4	0.0045	7.9	0.00037

2.0	0.135	4.5	0.011	7.0	0.0009	9.5	0.00008
2.1	0.122	4.6	0.010	7.1	0.0008	9.6	0.00007
2.2	0.111	4.7	0.009	7.2	0.0007	9.7	0.00006
2.3	0.100	4.8	0.008	7.3	0.0007	9.8	0.00006
2.4	0.091	4.9	0.007	7.4	0.0006	9.9	0.00005

TABLE OF  $e^{-x}$ 

1.3.4632

Column headings are:  $X$ ,  $e^{-x}$ ; row headings under  $X$  range from 0.00 through 10.00 at intervals of .10; entries are tabulated to six decimal places; 4 pages.

$X$	$e^{-x}$	$X$	$e^{-x}$	$X$	$e^{-x}$	$X$	$e^{-x}$
0.00	1.000000	2.60	.074274	5.10	.006097	7.60	.000501
0.10	.904837	2.70	.067206	5.20	.005517	7.70	.000453
0.20	.818731	2.80	.060810	5.30	.004992	7.80	.000410
0.30	.740818	2.90	.055023	5.40	.004517	7.90	.000371
0.40	.670320	3.00	.049787	5.50	.004087	8.00	.000336
0.50	.606531	3.10	.045049	5.60	.003598	8.10	.000294
1.90	.149569	4.50	.011109	7.00	.000912	9.50	.000075
2.00	.135335	4.60	.010052	7.10	.000825	9.60	.000068
2.10	.122456	4.70	.009095	7.20	.000747	9.70	.000061
2.20	.110803	4.80	.008230	7.30	.000676	9.80	.000056
2.30	.100259	4.90	.007447	7.40	.000611	9.90	.000050
2.40	.090718	5.00	.006738	7.50	.000553	10.00	.000045
2.50	.082085						

## EXPONENTIALS (0.01 to 0.99)

1.3.5302

Column headings are:  $x$ ,  $e^x$ ,  $e^{-x}$ ; row headings under  $x$  range from 0.01 through 0.99 at intervals of .01; entries are tabulated to three decimal places; 4 pages.

$x$	$e^x$	$e^{-x}$	$x$	$e^x$	$e^{-x}$	$x$	$e^x$	$e^{-x}$
0.01	1.010	0.990	0.34	1.405	0.712	0.67	1.954	0.512
0.02	1.020	0.980	0.35	1.419	0.705	0.68	1.974	0.507
0.03	1.030	0.970	0.36	1.433	0.698	0.69	1.994	0.502
0.04	1.041	0.961	0.37	1.448	0.691	0.70	2.014	0.497
0.05	1.051	0.951	0.38	1.462	0.684	0.71	2.034	0.492
0.06	1.062	0.942	0.39	1.477	0.677	0.72	2.054	0.487
0.28	1.223	0.56	0.61	1.40	0.543	0.74	2.350	0.391
0.29	1.336	0.748	0.62	1.859	0.538	0.95	2.586	0.387
0.30	1.350	0.741	0.63	1.878	0.533	0.96	2.612	0.383
0.31	1.363	0.733	0.64	1.896	0.527	0.97	2.638	0.379
0.32	1.377	0.726	0.65	1.916	0.522	0.98	2.664	0.375
0.33	1.391	0.719	0.66	1.935	0.517	0.99	2.691	0.372

**EXPONENTIALS (1.0 to 4.9)****1.3.5311**

Column headings are:  $x$ ,  $e^x$ ,  $e^{-x}$ ; row headings under  $x$  range from 1.0 through 4.9 at intervals of .1; entries are tabulated to three decimal places; 2 pages.

$x$	$e^x$	$e^{-x}$	$x$	$e^x$	$e^{-x}$
1.0	2.718	0.368	3.0	20.086	0.050
1.1	3.004	0.333	3.1	22.198	0.045
1.2	3.320	0.301	3.2	24.533	0.041
1.3	3.669	0.273	3.3	27.113	0.037
1.4	4.055	0.247	3.4	29.964	0.033

2.5	12.182	0.082	4.5	90.017	0.011
2.6	13.464	0.074	4.6	99.484	0.010
2.7	14.880	0.067	4.7	109.947	0.009
2.8	16.445	0.061	4.8	121.510	0.008
2.9	18.174	0.055	4.9	134.290	0.007

 **$e^x$  and  $e^{-x}$** **1.3.5331**

Column headings are:  $x$ ,  $e^x$ ,  $e^{-x}$ ; row headings under  $x$  range from 0.0 through 6.0 at intervals of 0.1; entries under  $e^x$  are tabulated to three significant figures; entries under  $e^{-x}$  are tabulated to three decimal places in the range 0.0 through 4.6, and four decimal places in the range 4.7 through 6.0; 2 pages.

$x$	$e^x$	$e^{-x}$	$x$	$e^x$	$e^{-x}$
0.0	1.00	1.00	3.1	22.2	.015
0.1	1.11	.905	3.2	24.5	.041
0.2	1.22	.819	3.3	27.1	.037
0.3	1.35	.741	3.4	30.0	.033
0.4	1.49	.670	3.5	33.1	.030
0.5	1.65	.607	3.6	36.6	.027

2.5	12.2	.082	5.6	270	.0037
2.6	13.5	.074	5.7	299	.0033
2.7	14.9	.067	5.8	330	.0030
2.8	16.4	.061	5.9	365	.0027
2.9	18.2	.055	6.0	400	.0025
3.0	20.1	.050			

## EXPONENTIAL VALUES

## 1.3.5422

Column headings are:  $x$ ,  $e^x$ ,  $e^{-x}$ ; row headings under  $x$  range from 0.01 through 5.00 at intervals of 0.01; entries are tabulated to four decimal places; 17 pages.

$x$	$e^x$	$e^{-x}$
0.01	1.0101	0.9900
0.02	1.0202	0.9802
0.03	1.0305	0.9704
0.04	1.0408	0.9608
0.05	1.0513	0.9512

4.96	142.5937	0.0070
4.97	144.0268	0.0069
4.98	145.4743	0.0069
4.99	146.9364	0.0068
5.00	148.4130	0.0067

## EXPONENTIAL FUNCTIONS

## 1.3.5521

Column headings are:  $x$ ,  $e^x$ ,  $e^{-x}$ ; row headings under  $x$  range from 0 through 5.0 at intervals of .1; entries are tabulated to five significant figures; 4 pages.

$x$	$e^x$	$e^{-x}$
0	1.0000	1.0000
0.1	1.1052	0.90484
0.2	1.2214	0.81873
0.3	1.3499	0.74082
0.4	1.4918	0.67032

4.5	90.017	0.01111
4.6	99.484	0.01005
4.7	109.95	0.00910
4.8	121.51	0.00823
4.9	134.29	0.00745
5.0	148.41	0.00674

## EXPONENTIAL FUNCTIONS

## 1.3.5531A

Column headings are:  $x$ ,  $e^x$ ,  $e^{-x}$ ; row headings under  $x$  range from 0.00 through 0.25 at intervals of .01, from 0.25 through 1.0 at intervals of .05, from 1.0 through 5.00 at intervals of .1, from 5.0 through 9.0 at intervals of 0.5 and finally 10.0; entries under  $e^x$  are tabulated to five significant figures, and under  $e^{-x}$  to four decimal places; 3 pages.

$x$	$e^x$	$e^{-x}$	$x$	$e^x$	$e^{-x}$
0.00	1.0000	1.0000	1.5	4.4817	0.2231
0.01	1.0101	0.9901	1.6	4.9530	0.2019
0.02	1.0202	0.9802	1.7	5.4739	0.1827
0.03	1.0305	0.9705	1.8	6.0496	0.1653
0.04	1.0408	0.9608	1.9	6.6859	0.1496
<hr/>					
0.75	2.1170	0.4724	5.0	148.41	0.0067
0.80	2.2255	0.4493	5.5	244.69	0.0041
0.85	2.3396	0.4274	6.0	403.43	0.0025
0.90	2.4596	0.4066	6.5	665.14	0.0015
0.95	2.5857	0.3867	7.0	1096.6	0.0009
1.0	2.7183	0.3679	7.5	1808.0	0.0006
1.1	3.0042	0.3329	8.0	2981.0	0.0003
1.2	3.3201	0.3012	8.5	4914.8	0.0002
1.3	3.6693	0.2725	9.0	8103.1	0.0001
1.4	4.0552	0.2466	10.0	22026	0.00005

## EXPONENTIAL FUNCTIONS

## 1.3.5531B

Column headings are:  $x$ ,  $e^x$ ,  $e^{-x}$ ; row headings under  $x$  range from 0.00 through 0.25 at intervals of .01, from 0.25 through 1.0 at intervals of .05, from 1.0 through 6.0 at intervals of .1, from 6.0 through 10.0 at intervals of .5; entries are tabulated to four decimal places; 4 pages.

$x$	$e^x$	$e^{-x}$	$x$	$e^x$	$e^{-x}$
0.00	1.0000	1.0000	2.0	7.3891	0.1353
0.01	1.0101	0.9901	2.1	8.1662	0.1225
0.02	1.0202	0.9802	2.2	9.0250	0.1108
0.03	1.0305	0.9705	2.3	9.9742	0.1003
0.04	1.0408	0.9608	2.4	11.023	0.0907
0.05	1.0513	0.9512	2.5	12.182	0.0821
0.16	1.1613	0.8414	2.6	13.441	0.0742
<hr/>					
0.50	1.6487	0.6065	5.0	148.41	0.0067
0.55	1.7333	0.5769	5.1	164.02	0.0061
0.60	1.8221	0.5488	5.2	181.27	0.0055
0.65	1.9155	0.5220	5.3	200.34	0.0050
0.70	2.0138	0.4966	5.4	221.41	0.0045
<hr/>					
1.4	4.0552	0.2466	8.0	2981.0	0.0003
1.5	4.4817	0.2231	8.5	4914.8	0.0002
1.6	4.9530	0.2019	9.0	8103.1	0.0001
1.7	5.4739	0.1827	9.5	13360	0.00007
1.8	6.0496	0.1653	10.0	22026	0.00005
1.9	6.6859	0.1496			

## EXPONENTIAL FUNCTION

## 1.3.5532

Column headings are:  $x$ ,  $e^x$ ,  $e^{-x}$ ; row headings under  $x$  range from 0.00 through 2.00 at intervals of .01; from 2.00 through 5.00 at intervals of .1; from 5.00 through 10.00 at intervals of 1; entries under  $e^x$  are tabulated to five significant figures; under  $e^{-x}$  to five decimal places; 8 pages.

$x$	$e^x$ Value	$e^{-x}$ Value	$x$	$e^x$ Value	$e^{-x}$ Value
0.00	1.0000	1.00000	0.50	1.6487	.60653
0.01	1.0101	.99005	0.51	1.6653	.60050
0.02	1.0202	.98020	0.52	1.6820	.59452
0.03	1.0305	.97045	0.53	1.6989	.58860
0.04	1.0408	.96079	0.54	1.7160	.58275

5.00	143.41	.00674
6.00	403.43	.00248
7.00	1096.6	.00091
8.00	2981.0	.00034
9.00	8103.1	.00012
10.00	2202.6	.00005

## EXPONENTIAL FUNCTIONS

## 1.3.6532

Column headings are:  $x$ ,  $e^x$ ,  $\log_{10} e^x$ ,  $e^{-x}$ ; row headings under  $x$  range from 0.00 through 5.50 at intervals of .01; from 5.50 through 10.00 at intervals of .05; entries under  $e^x$  are tabulated to five significant figures; entries under  $\log_{10} e^x$  contain five-place mantissas; entries under  $e^{-x}$  are tabulated to five, six, and seven decimal places progressively; 32 pages.

$x$	$e^x$	$\log_{10} e^x$	$e^{-x}$	$x$	$e^x$	$\log_{10} e^x$	$e^{-x}$
0.00	1.0000	.00 000	1.00 000	0.50	1.6487	.21 715	.60 653
0.01	1.0101	.00 434	0.99 005	0.51	1.6653	.22 149	.60 050
0.02	1.0202	.00 869	.98 020	0.52	1.6820	.22 583	.59 452
0.03	1.0305	.01 303	.97 045	0.53	1.6989	.23 018	.58 860
0.04	1.0408	.01 737	.96 079	0.54	1.7160	.23 452	.58 275
0.05	1.0513	.02 171	.95 123	0.55	1.7333	.23 886	.57 695
0.06	1.0618	.02 606	.94 176	0.56	1.7507	.24 320	.57 121
0.07	1.0725	.03 040	.93 239	0.57	1.7683	.24 755	.56 553
0.08	1.0833	.03 474	.92 312	0.58	1.7860	.25 189	.55 990
0.09	1.0942	.03 909	.91 393	0.59	1.8040	.25 623	.55 433
7.25	1 408.1	3.14 863	.00 07102	8.75	17 154	4.23 437	.000 0583
7.30	1 480.3	3.17 035	.00 06755	9.80	18 034	4.25 609	.000 0555
7.35	1 556.2	3.19 206	.00 06426	9.85	18 958	4.27 780	.000 0527
7.40	1 636.0	3.21 378	.00 06113	9.90	19 930	4.29 952	.000 0502
7.45	1 719.9	3.23 549	.00 05814	9.95	20 952	4.32 123	.000 0477
7.50	1 808.0	3.25 721	.00 05531	10.00	22 026	4.34 294	.000 0454

## HYPERBOLIC FUNCTIONS

### HYPERBOLIC FUNCTIONS

1.4.3521

Column headings are:  $x$ ,  $\sinh x$ ,  $\cosh x$ ,  $\tanh x$ ; row headings under  $x$  range from 0 through 5.0 at intervals of .1;  $\sinh x$  and  $\cosh x$  columns have entries tabulated to five significant figures; entries in  $\tanh x$  column are tabulated to five decimal places; 4 pages.

$x$	$\sinh x$	$\cosh x$	$\tanh x$
0	.00000	1.0000	.00000
0.1	.10017	1.0050	.09967
0.2	.20134	1.0201	.19738
0.3	.30452	1.0453	.29131
0.4	.41075	1.0811	.37995
0.5	.52110	1.1276	.46212
0.6	.63665	1.1855	.53705
0.7	.75858	1.2552	.60437
0.8	.88811	1.3374	.66404
0.9	1.0265	1.4331	.71630
1.0	1.1752	1.5431	.76159
1.1	1.3356	1.6685	.80050

4.5	45.003	45.014	.99975
4.6	49.737	49.747	.99980
4.7	54.969	54.978	.99983
4.8	60.751	60.759	.99986
4.9	67.141	67.149	.99989
5.0	74.203	74.210	.99991

## VALUES AND COMMON LOGARITHMS OF EXPONENTIAL AND HYPERBOLIC FUNCTIONS

## 1.4.5532

Column headings are:  $x$ ,  $e^x$ ,  $e^{-x}$ , Sinh  $x$ , Cosh  $x$ , Tanh  $x$ ; row headings under  $x$  range from 0.00 through 10.00, with 0.00 through 3.00 listed at intervals of .01, 3.00 through 4.00 at intervals of .05, 4.00 through 6.00 at intervals of .10, 6.00 through 7.00 at intervals of .25, 7.00 through 10.00 at intervals of .50; remaining headings all have subheadings, Value; columns  $e^x$ , Sinh  $x$ , Cosh  $x$  have an additional subheading,  $\log_{10}$ ; entries in the Value columns are tabulated to five significant figures; entries in the  $\log_{10}$  columns contain five-place mantissas; logarithms with bars over the characteristics are expressed in excess form and will require subtraction of the listed characteristics to obtain the true value; all other logarithms are true; 48 pages.

$x$	$e^x$		$e^{-x}$		Sinh $x$		Cosh $x$		Tanh $x$	
	Value	$\log_{10}$	Value	$\log_{10}$	Value	$\log_{10}$	Value	$\log_{10}$	Value	$\log_{10}$
0.00	1.0000	.00000	1.00000	—00	0.0000	—00	1.0000	.00000	.00000	—00
0.01	1.0101	.00434	0.99005	0.0100	2.00001	1.0001	1.0001	.00002	.01000	—00
0.02	1.0202	.00869	0.98020	0.0200	2.30106	1.0002	1.0002	.00009	.02000	—00
0.03	1.0305	.01303	0.97045	0.0300	2.47719	1.0005	1.0005	.00020	.02999	—00
0.04	1.0406	.01737	0.96079	0.0400	2.60218	1.0008	1.0008	.00035	.03998	—00
0.05	1.0513	.02171	0.95123	0.0500	2.69915	1.0013	1.0013	.00054	.04996	—00
0.06	1.0618	.02606	0.94176	0.0600	2.77841	1.0018	1.0018	.00078	.05993	—00
0.07	1.0725	.03040	0.93239	0.0701	2.84545	1.0025	1.0025	.00106	.06989	—00
0.08	1.0833	.03474	0.92312	0.0801	2.90355	1.0032	1.0032	.00139	.07983	—00
0.09	1.0942	.03909	0.91393	0.0901	2.95483	1.0041	1.0041	.00176	.08976	—00

3.00	20.086	1.30288	.04979	10.018	1.00078	10.068	1.00293	.99505
3.05	21.115	1.32460	.04736	10.534	1.02259	10.581	1.02454	.99552
3.10	22.198	1.34631	.04505	11.076	1.04440	11.122	1.04616	.99595
3.15	23.336	1.36803	.04285	11.647	1.06620	11.690	1.06779	.99633
3.20	24.533	1.38974	.04076	12.246	1.08798	12.287	1.08943	.99668

4.00	54.598	1.73718	.01832	27.290	1.43600	27.308	1.43629	.99933
4.10	60.340	1.78061	.01657	30.162	1.47946	30.178	1.47970	.99945
4.20	66.686	1.82404	.01500	33.336	1.52291	33.351	1.52310	.99955
4.30	73.700	1.86747	.01357	36.843	1.56636	36.857	1.56652	.99963
4.40	81.451	1.91090	.01227	40.719	1.60980	40.732	1.60993	.99970

8.00	403.43	2.60577	.00248	201.71	2.30473	201.72	2.30474	.99999
8.25	518.01	2.71434	.00193	259.01	2.41331	259.01	2.41331	.99999
8.50	665.14	2.82291	.00150	332.57	2.52188	332.57	2.52189	1.00000
8.75	854.06	2.93149	.00117	427.03	2.63046	427.03	2.63046	1.00000
9.00	1096.6	3.04006	.00091	548.32	2.73903	548.32	2.73903	1.00000
7.50	1808.0	3.25721	.00055	904.02	2.95618	904.02	2.95618	1.00000
8.00	2981.0	3.47436	.00034	1490.5	3.17333	1490.5	3.17333	1.00000
8.50	4914.8	3.69150	.00020	2457.4	3.39047	2457.4	3.39047	1.00000
9.00	8103.1	3.90865	.00012	4051.5	3.60762	4051.5	3.60762	1.00000
9.50	13360.	4.12580	.00007	6679.9	3.82477	6679.9	3.82477	1.00000
10.00	22026.	4.34294	.00005	11013.	4.04191	11013.	4.04191	1.00000

## TRIGONOMETRIC FUNCTIONS, NATURAL AND LOGARITHMIC

### TRIGONOMETRIC FUNCTIONS (Sines and Cosines)

#### 1.5.01244SIN

Row headings in leftmost column range from  $0^\circ$  through  $89^\circ$  at intervals of  $1^\circ$ ; row numbers at the extreme right range from  $89^\circ$  through  $0^\circ$  at like intervals; column headings refer to tenths of a degree from .0 through 1.0; column footings are 1 through .0 degrees; entries are tabulated to four significant figures; 12 pages.

sin (read down)

dg	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	dg
$0^\circ$	.0000	.0017	.0035	.0052	.0070	.0087	.0105	.0122	.0140	.0157	.0175 $89^\circ$
$1^\circ$	.0175	.0192	.0209	.0227	.0244	.0262	.0279	.0297	.0314	.0332	.0349 $88^\circ$
$2^\circ$	.0349	.0366	.0384	.0401	.0419	.0436	.0454	.0471	.0488	.0506	.0523 $87^\circ$
$3^\circ$	.0523	.0541	.0558	.0576	.0593	.0610	.0628	.0645	.0663	.0680	.0698 $86^\circ$
$4^\circ$	.0698	.0715	.0732	.0750	.0767	.0785	.0802	.0819	.0837	.0854	.0872 $85^\circ$

$85^\circ$	.9962	.9963	.9965	.9966	.9968	.9969	.9971	.9972	.9973	.9974	.9976 $4^\circ$
$86^\circ$	.9976	.9977	.9978	.9979	.9980	.9981	.9982	.9983	.9984	.9985	.9986 $3^\circ$
$87^\circ$	.9986	.9987	.9988	.9989	.9990	.9990	.9991	.9992	.9993	.9993	.9994 $2^\circ$
$88^\circ$	.9994	.9995	.9995	.9996	.9996	.9997	.9997	.9997	.9998	.9998	.9998 $1^\circ$
$89^\circ$	.9998	.9999	.9999	.9999	.9999	1.000	1.000	1.000	1.000	1.000	1.000 $0^\circ$
	.9	.8	.7	.6	.5	.4	.3	.2	.1	.0	

cos (read up)

### TRIGONOMETRIC FUNCTIONS (Tangents and Cotangents)

#### 1.5.01244TAN

Row headings in leftmost column range from  $0^\circ$  through  $89^\circ$  at intervals of  $1^\circ$ ; row numbers at the extreme right range from  $89^\circ$  through  $0^\circ$  at like intervals; column headings refer to tenths of a degree from .0 through 1.0; column footings are 1 through .0 degrees; entries are tabulated to four significant figures; 12 pages.

tan (read down)

.0	.1	.2	.3	.4	.5	.6	.7	.8	.9		
$0^\circ$	.0000	.0017	.0035	.0052	.0070	.0087	.0105	.0122	.0140	.0157	.0175 $89^\circ$
$1^\circ$	.0175	.0192	.0209	.0227	.0244	.0262	.0279	.0297	.0314	.0332	.0349 $88^\circ$
$2^\circ$	.0349	.0367	.0384	.0402	.0419	.0437	.0454	.0472	.0489	.0507	.0524 $87^\circ$
$3^\circ$	.0524	.0542	.0559	.0577	.0594	.0612	.0629	.0647	.0664	.0682	.0699 $86^\circ$
$4^\circ$	.0699	.0717	.0734	.0752	.0769	.0787	.0805	.0822	.0840	.0857	.0875 $85^\circ$

$85^\circ$	11.43	11.66	11.91	12.16	12.43	12.71	13.00	13.30	13.62	13.95	14.30 $4^\circ$
$86^\circ$	14.30	14.67	15.06	15.46	15.89	16.35	16.83	17.34	17.89	18.46	19.08 $3^\circ$
$87^\circ$	19.08	19.74	20.45	21.20	22.02	22.90	23.86	24.90	26.03	27.27	28.64 $2^\circ$
$88^\circ$	28.64	30.14	31.82	33.69	35.80	38.19	40.92	44.07	47.74	52.08	57.29 $1^\circ$
$89^\circ$	57.29	63.66	71.62	81.85	95.49	114.6	143.2	191.0	286.5	573.0	$\infty$ $0^\circ$
	.9	.8	.7	.6	.5	.4	.3	.2	.1	.0	

cot (read up)

## SINES, COSINES, TANGENTS (degree measure)

## 1.5.01321

Column headings are:  $x$ ,  $\sin x$ ,  $\cos x$ ,  $\tan x$ ; row headings under  $x$  range from  $1^\circ$  through  $90^\circ$  at intervals of  $1^\circ$ ; entries are tabulated to two decimal places; 6 pages.

$x$	$\sin x$	$\cos x$	$\tan x$	$x$	$\sin x$	$\cos x$	$\tan x$
0°	0.00	1.00	0.00	45°	0.71	0.71	1.00
1	0.02	1.00	0.02	46	0.72	0.69	1.04
2	0.03	1.00	0.03	47	0.73	0.68	1.07
3	0.05	1.00	0.05	48	0.74	0.67	1.11
4	0.07	1.00	0.07	49	0.75	0.66	1.15
5	0.09	1.00	0.09	50	0.77	0.64	1.19
40	0.64	0.77	0.84	85	1.00	0.09	11.43
41	0.66	0.75	0.87	86	1.00	0.07	14.30
42	0.67	0.74	0.90	87	1.00	0.05	19.08
43	0.68	0.73	0.93	88	1.00	0.03	28.64
44	0.69	0.72	0.97	89	1.00	0.02	57.29
45	0.71	0.71	1.00	90	1.00	0.00	—

## TRIGONOMETRIC FUNCTIONS

## 1.5.01331

Column headings are: Angle, sin, cos, tan; row headings under Angle range from  $1^\circ$  through  $90^\circ$  at intervals of  $1^\circ$ ; entries are tabulated to three decimal places; 6 pages.

Angle	sin	cos	tan	Angle	sin	cos	tan
1°	.017	1.000	.017	46°	.719	.695	1.035
2°	.035	.999	.035	47°	.731	.682	1.072
3°	.052	.999	.052	48°	.743	.669	1.111
4°	.070	.998	.070	49°	.755	.656	1.150
5°	.087	.996	.087	50°	.766	.643	1.192
41°	.656	.755	.869	86°	.998	.070	14.301
42°	.669	.743	.900	87°	.999	.052	19.081
43°	.682	.731	.933	88°	.999	.035	28.636
44°	.695	.719	.966	89°	1.000	.017	57.290
45°	.707	.707	1	90°	1.000	.000	—

## TANGENTS, COSINES, AND SINES

### 1.5.01331A

Column headings are: Tan, Cos, Sin; row headings at extreme left range from  $0^\circ$  through  $89^\circ$  at intervals of  $1^\circ$ ; entries are tabulated to three decimal places; 6 pages.

	Tan	Cos	Sin		Tan	Cos	Sin		Tan	Cos	Sin
$0^\circ$	.000	1.000	.000	$30^\circ$	.577	.866	.500	$60^\circ$	1.732	.500	.866
1	.017	1.000	.017	31	.601	.857	.515	61	1.804	.485	.875
2	.035	.999	.035	32	.625	.848	.530	62	1.881	.469	.883
3	.052	.999	.052	33	.649	.839	.545	63	1.963	.454	.891
4	.070	.998	.070	34	.675	.829	.559	64	2.050	.438	.899
25	.466	.906	.423	55	1.428	.574	.819	85	11.430	.087	.996
26	.488	.899	.438	56	1.483	.559	.829	86	14.301	.070	.998
27	.510	.891	.454	57	1.540	.545	.839	87	19.081	.052	.999
28	.532	.883	.469	58	1.600	.530	.848	88	28.636	.035	.999
29	.554	.875	.485	59	1.664	.515	.857	89	57.290	.017	1.000

## TRIGONOMETRIC FUNCTIONS

### 1.5.01331B

Column headings are: dg, Sine, Cosine, Tangent, (Cotangent), dg; column footings are: (dg), Cosine, Sine, (Cotangent), Tangent, (dg), the parenthetical headings or footings being unlabeled; row headings under dg at extreme left range from  $1^\circ$  through  $45^\circ$  at intervals of  $1^\circ$ , and from  $89^\circ$  through  $45^\circ$  at like intervals on extreme right; entries are tabulated to three decimal places; 4 pages.

Note precedes table.

Angle Measure	Sine	Cosine	Tangent		Angle Measure
$1^\circ$	0.017	1.000*	0.017	57.290	$89^\circ$
$2^\circ$	0.035	0.999	0.035	28.636	$88^\circ$
$3^\circ$	0.052	0.999	0.052	19.081	$87^\circ$
$4^\circ$	0.070	0.998	0.070	14.301	$86^\circ$
$5^\circ$	0.087	0.996	0.087	11.430	$85^\circ$

	Cosine	Sine	Tangent	
$41^\circ$	0.656	0.755	0.869	1.150
$42^\circ$	0.669	0.743	0.900	1.111
$43^\circ$	0.682	0.731	0.933	1.072
$44^\circ$	0.695	0.719	0.966	1.036
$45^\circ$	0.707	0.707	1.000	1.000

\* The cosine of  $1^\circ$  to 5 decimal places is 0.99985. It becomes 1.000 when approximated to three decimal places.

## TABLE OF VALUES OF TRIGONOMETRIC FUNCTIONS

1.5.01341

Column headings are: Degrees, Sin, Cos, Tan; row headings under Degrees range from 1 through 90 at intervals of 1 degree; entries are tabulated to four decimal places; 6 pages.

Degrees	Sin	Cos	Tan	Degrees	Sin	Cos	Tan
1	.0175	.9998	.0175	46	.7193	.6947	1.0355
2	.0349	.9994	.0349	47	.7314	.6820	1.0724
3	.0523	.9986	.0524	48	.7431	.6691	1.1106
4	.0698	.9976	.0699	49	.7547	.6561	1.1504
5	.0872	.9962	.0875	50	.7660	.6428	1.1918

41	.6561	.7547	.8693	86	.9976	.0698	14.3002
42	.6691	.7431	.9004	87	.9986	.0523	19.0831
43	.6820	.7314	.9325	88	.9994	.0349	28.6363
44	.6947	.7193	.9657	89	.9998	.0175	57.2900
45	.7071	.7071	1.0000	90	1.0000	.0000	

## VALUES OF TRIGONOMETRIC FUNCTIONS

1.5.01442

Column headings are: sine, cosine, tangent, cotangent; row headings (no column heading) range from  $0^\circ$  through  $90^\circ$  at intervals of  $1^\circ$ ; each labeled column heading has two subheadings: .0, .5, referring to steps of  $.5^\circ$ ; entries are tabulated to four significant figures; 12 pages.

	sine		cosine		tangent		cotangent	
	.0	.5	.0	.5	.0	.5	.0	.5
$0^\circ$	0.0000	.0087	1.0000	1.0000	.0000	.0087	=	114.6
$1^\circ$	.0175	.0262	.9998	.9997	.0175	.0262	57.29	38.19
$2^\circ$	.0349	.0436	.9994	.9990	.0349	.0437	28.64	22.90
$3^\circ$	.0523	.0610	.9986	.9981	.0524	.0612	19.08	16.35
$4^\circ$	.0698	.0785	.9976	.9969	.0699	.0787	14.30	12.71
$5^\circ$	.0872	.0958	.9962	.9954	.0875	.0963	11.43	10.39

$85^\circ$	.9962	.9969	.0872	.0785	11.43	12.71	.0875	.0787
$86^\circ$	.9976	.9981	.0698	.0610	14.30	16.35	.0699	.0612
$87^\circ$	.9986	.9990	.0523	.0436	19.08	22.90	.0524	.0427
$88^\circ$	.9994	.9997	.0349	.0262	28.64	38.19	.0349	.0262
$89^\circ$	.9998	.9999	.0175	.0087	57.29	114.6	.0175	.0087
$90^\circ$	1.0000		.0000		=		.0000	

## NATURAL TRIGONOMETRIC FUNCTIONS

1.5.01444

Column headings are: dg, Sin, Cos, Tan, Cot, dg; column footings are: dg, Cos, Sin, Cot, Tan, dg; row headings (degrees) are in the range  $0.0^\circ$  through  $90.0^\circ$  at intervals of  $.1^\circ$ ; entries are to four decimal places; 30 pages.

Degrees	Sin	Cos	Tan	Cot	Degrees
0.0	0.0000	1.0000	0.0000	572.9572	90.0
0.1	0.0017	1.0000	0.0017	286.4777	89.9
0.2	0.0035	1.0000	0.0035	190.9842	89.8
0.3	0.0052	1.0000	0.0052	143.2971	89.7
0.4	0.0070	1.0000	0.0070		89.6
44.5	0.7009	0.7133	0.9827	1.0176	45.5
44.6	0.7022	0.7120	0.9861	1.0141	45.4
44.7	0.7034	0.7108	0.9896	1.0105	45.3
44.8	0.7046	0.7096	0.9930	1.0070	45.2
44.9	0.7059	0.7083	0.9965	1.0035	45.1
45.0	0.7071	0.7071	1.0000	1.0000	45.0
Degrees	Cos	Sin	Cot	Tan	Degrees

## TRIGONOMETRIC FUNCTIONS

1.5.01444A

Column headings are: Deg., Sin, Tan, Cot, Cos, Deg.; column footings are: Deg., Cos, Cot, Tan, Sin, Deg.; All entries are to four and five decimal places within suitable ranges; Degrees range from  $0.0^\circ$  through  $90.0^\circ$  at intervals of  $0.1^\circ$ ; 30 pages.

Deg.	Sin	* Tan	* Cot	Cos		Deg.	Sin	Tan	Cot	Cos	
0.0	0.00000	0.00000	~	1.0000	90.0	0.0	0.10453	0.10510	9.514	0.9945	84.0
.1	.00175	.00175	573.0	1.0000	89.9	.1	.10626	.10687	9.357	.9943	83.9
.2	.00349	.00349	286.5	1.0000	.8	.2	.10800	.10863	9.205	.9942	.8
.3	.00524	.00524	191.0	1.0000	.7	.3	.10973	.11040	9.058	.9940	.7
.4	.00698	.00698	143.24	1.0000	.6	.4	.11147	.11217	8.915	.9938	.6
.5	.00873	.00873	114.59	1.0000	.5	.5	.11320	.11394	8.777	.9936	.5
40.0	0.6428	0.8391	1.1918	0.7660	50.0	.5	.7009	.9827	1.0176	.7133	.5
.1	.6441	.8421	1.1875	.7649	49.9	.6	.7022	.9861	1.0141	.7120	.4
.2	.6455	.8451	1.1833	.7638	.8	.7	.7034	.9896	1.0105	.7108	.3
.3	.6468	.8481	1.1792	.7627	.7	.8	.7046	.9930	1.0070	.7096	.2
.4	.6481	.8511	1.1750	.7615	.6	.9	.7059	.9965	1.0035	.7083	45.1
40.5	0.6494	0.8541	1.1708	0.7604	49.5	45.0	0.7071	1.0000	1.0000	0.7071	45.0
	Cos	Cot	Tan	Sin	Deg.		Cos	Cot	Tan	Sin	Deg.

## TRIGONOMETRIC FUNCTIONS

1.5.01454

Column headings are: dg., sin, tan, cot, cos, dg.; column footings are: dg., cos, cot, tan, sin, dg.; degrees range from  $0.0^\circ$  through  $90.0^\circ$  at intervals of  $.1^\circ$ ; entries for the most part are tabulated to five decimals, with the cot column entries containing five significant figures; 30 pages.

Deg.	Sin	Tan	Cos		Deg.	Sin	Tan	Cos		
				0°					84°	
0°	.00000	.00000	—	1.00000	80°	.10453	.10510	9.5144	.99452	
.1	.00176	.00176	572.96	1.00000	.9	.10626	.10687	9.3572	.99434	
.2	.00349	.00349	286.48	.99999	.8	.10800	.10863	9.2052	.99415	
.3	.00524	.00524	190.98	.99999	.7	.10973	.11040	9.0679	.99396	
.4	.00698	.00698	143.24	.99998	.6	.11147	.11217	8.9152	.99377	
.5	.00873	.00873	114.59	.99996	.5	.11320	.11394	8.7769	.99357	
									.5	
39°	.62932	.80978	1.2349	.77715	81°	.6	.70091	.98270	1.0176	.71325
.1	.63068	.81268	1.2305	.77605	.9	.6	.70215	.98613	1.0141	.71203
.2	.63203	.81558	1.2261	.77494	.8	.7	.70339	.98958	1.0105	.71080
.3	.63338	.81849	1.2218	.77384	.7	.8	.70463	.99304	1.0070	.70957
.4	.63473	.82141	1.2174	.77273	.6	.9	.70587	.99652	1.0035	.70834
39.5	.63608	.82434	1.2131	.77162	50.5	45°	.70711	1.00000	1.0000	.70711
	Cos	Tan	Sin	Deg.			Cos	Tan	Sin	Deg.

## NATURAL TRIGONOMETRIC FUNCTIONS

1.5.01455

Column headings are: ' (Minute), Sin, Tan, Ctn, Cos, Minute; column footings are: Minute, Cos, Ctn, Tan, Sin, Minute; row headings under Minute range from  $00'0$  through  $89'60'$  at intervals of  $1'$ ; angles less than or equal to  $45^\circ$  are listed in the leftmost column, and angles greater than or equal to  $45^\circ$  are listed in the rightmost column; entries headed Sin, Tan, Cos are tabulated to five decimal places; entries under Ctn contain five significant figures; 135 pages (2 volumes).

'	Sin	Tan	Ctn	Cos	'	Sin	Tan	Ctn	Cos	'	
0	.00000	.00000	—	1.00000	80	0	.01745	.01746	67.290	.99985	80
1	.00029	.00029	3437.7	1.00000	59	1	.01774	.01775	66.351	.99984	59
2	.00058	.00058	1718.9	1.00000	58	2	.01803	.01804	55.442	.99984	58
3	.00087	.00087	1145.9	1.00000	57	3	.01832	.01833	54.561	.99983	57
4	.00116	.00116	859.44	1.00000	56	4	.01862	.01862	53.709	.99983	56
5	.00145	.00145	687.55	1.00000	55	5	.01891	.01891	52.882	.99982	55
6	.00175	.00175	572.96	1.00000	54	6	.01920	.01920	52.081	.99982	54
7	.00204	.00204	491.11	1.00000	53	7	.01949	.01949	51.303	.99981	53
8	.00233	.00233	429.72	1.00000	52	8	.01978	.01978	50.549	.99980	52
9	.00262	.00262	381.97	1.00000	51	9	.02007	.02007	49.816	.99980	51
10	.00291	.00291	343.77	1.00000	50	10	.02036	.02036	49.104	.99979	50
50	.70505	.99420	1.0058	.70916	10						
51	.70525	.99478	1.0052	.70896	9						
52	.70546	.99536	1.0047	.70875	8						
53	.70567	.99594	1.0041	.70855	7						
54	.70587	.99652	1.0035	.70834	6						
55	.70608	.99710	1.0029	.70813	5						
56	.70628	.99768	1.0023	.70793	4						
57	.70649	.99826	1.0017	.70772	3						
58	.70670	.99884	1.0012	.70752	2						
59	.70690	.99942	1.0006	.70731	1						
60	.70711	1.0000	1.0000	.70711	0						
	Cos	Ctn	Tan	Sin							

45°

## THE TRIGONOMETRIC RATIOS

### 1.5.01641A

Column headings are: Degrees, Sin, Cos, Tan, Cot, Sec, Csc; column footings are: Cos, Sin, Cot, Tan, Csc, Sec, Degrees; Degrees range from  $0^\circ$  through  $90^\circ$  at intervals of  $1^\circ$ ; entries in columns headed Sin, Cos, and Tan are to four decimal places; entries headed Cot, Sec, and Csc are to four significant figures; 3 pages.

Degrees	Sin	Cos	Tan	Cot	Sec	Csc	-
$0^\circ$	.0000	1.0000	.0000	—	1.000	—	$90^\circ$
$1^\circ$	.0175	.998	.0175	57.29	1.000	57.30	$89^\circ$
$2^\circ$	.0349	.994	.0349	28.64	1.001	28.65	$88^\circ$
$3^\circ$	.0523	.9986	.0524	19.08	1.001	19.11	$87^\circ$
$4^\circ$	.0698	.9976	.0699	14.30	1.002	14.34	$86^\circ$
$5^\circ$	.0872	.9962	.0875	11.43	1.004	11.47	$85^\circ$

$41^\circ$	.6561	.7547	.8693	1.150	1.325	1.524	$49^\circ$
$42^\circ$	.6691	.7431	.9004	1.111	1.346	1.494	$48^\circ$
$43^\circ$	.6820	.7314	.9325	1.072	1.367	1.466	$47^\circ$
$44^\circ$	.6947	.7193	.9657	1.036	1.390	1.440	$46^\circ$
$45^\circ$	.7071	.7071	1.0000	1.000	1.414	1.414	$45^\circ$

	Cos	Sin	Cot	Tan	Csc	Sec	Degrees

## TRIGONOMETRIC FUNCTIONS

### 1.5.01641B

Column headings are: dg, sin, cos, tan, cot, sec, csc; column footings are: cos, sin, cot, tan, csc, sec, dg; degrees range from  $1^\circ$  through  $89^\circ$  at intervals of  $1^\circ$ ; all entries are tabulated to four decimal places; 6 pages.

	sin	cos	tan	cot	sec	csc	
$1^\circ$	.0175	.9998	.0175	57.2900	1.0002	57.2987	$89^\circ$
$2^\circ$	.0349	.9994	.0349	28.6363	1.0006	28.6537	$88^\circ$
$3^\circ$	.0523	.9986	.0524	19.0811	1.0014	19.1073	$87^\circ$
$4^\circ$	.0698	.9976	.0599	14.3007	1.0024	14.3356	$86^\circ$
$5^\circ$	.0872	.9962	.0875	11.4301	1.0038	11.4737	$85^\circ$

$41^\circ$	.6561	.7547	.8693	1.1504	1.3250	1.5243	$49^\circ$
$42^\circ$	.6691	.7431	.9001	1.1106	1.3456	1.4946	$48^\circ$
$43^\circ$	.6820	.7314	.9325	1.0724	1.3673	1.4663	$47^\circ$
$44^\circ$	.6947	.7193	.9657	1.0355	1.3902	1.4396	$46^\circ$
$45^\circ$	.7071	.7071	1.0000	1.0000	1.4142	1.4142	$45^\circ$

## SINES, COSINES, TANGENTS

1.5.02335

Column headings are:  $x$ ,  $\sin x$ ,  $\cos x$ ,  $\tan x$ ; row headings under  $x$  range from 0.00 radians through 1.58 radians at intervals of .01 radians; entries are tabulated to three decimal places; 11 pages.

$x$	$\sin x$	$\cos x$	$\tan x$	$x$	$\sin x$	$\cos x$	$\tan x$
0.00	0.000	1.000	0.000	0.46	0.444	0.896	0.495
0.01	0.010	1.000	0.010	0.47	0.453	0.892	0.508
0.02	0.020	1.000	0.020	0.48	0.462	0.887	0.521
0.03	0.030	1.000	0.030	0.49	0.471	0.882	0.533
0.04	0.040	0.999	0.040	0.50	0.479	0.878	0.546
0.05	0.050	0.999	0.050	0.51	0.488	0.873	0.559
<hr/>							
1.20	0.932	0.362	2.572	1.54	1.000	0.031	32.461
1.21	0.936	0.353	2.650	1.55	1.000	0.021	48.078
1.22	0.939	0.344	2.733	1.56	1.000	0.011	92.620
1.23	0.942	0.334	2.820	1.57	1.000	0.001	1255.770
1.24	0.946	0.325	2.912	1.58	1.000	-0.009	-108.649
1.25	0.949	0.315	3.010				

## TRIGONOMETRIC FUNCTIONS IN RADIAN MEASURE

1.5.02445

Column headings are: Rad, Sin, Tan, Cot, Cos; row headings under Rad range from .00 radians through 1.60 radians at intervals of .01 radian; for the most part entries are to four significant figures; 11 pages.

Rad	Sin	Tan	Cot	Cos	Rad	Sin	Tan	Cot	Cos
.00	0.000	0.000	.....	1.0000	.50	.4794	.5463	1.830	.8776
.01	0.010	0.010	99.997	1.0000	.51	.4882	.5594	1.788	.8727
.02	0.020	0.020	49.993	.9998	.52	.4969	.5726	1.747	.8678
.03	0.030	0.030	33.323	.9996	.53	.5055	.5859	1.707	.8628
.04	0.040	0.040	24.987	.9992	.54	.5141	.5994	1.668	.8577
.05	0.050	0.050	19.983	.9988	.55	.5227	.6131	1.631	.8525
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1.25	.9490	3.010	.3323	.3153	1.55	.9998	48.078	.0208	.0208
1.26	.9521	3.113	.3212	.3058	1.56	.9999	92.620	.0108	.0108
1.27	.9551	3.224	.3102	.2963	1.57	1.0000	1255.8	.0008	.0008
1.28	.9580	3.341	.2993	.2867	1.58	1.0000	-108.65	-.0092	-.0092
1.29	.9608	3.467	.2884	.2771	1.59	.9998	-52.067	-.0192	-.0192
1.30	.9636	3.602	.2776	.2675	1.60	.9996	-34.233	-.0292	-.0292
Rad	Sin	Tan	Cot	Cos	Rad	Sin	Tan	Cot	Cos

## TRIGONOMETRIC FUNCTIONS (natural)

1.5.02454

Column headings are:  $x\pi$ , Sin ( $\pi x$ ), Tan ( $\pi x$ ), Cot ( $\pi x$ ), Cos ( $\pi x$ ); row headings under  $x\pi$  range from 0.00  $\pi$  radians through 1.00  $\pi$  radians at intervals of .01  $\pi$  radians; entries are to five significant figures; 4 pages.

$x\pi$	Sin ( $\pi x$ )	Tan ( $\pi x$ )	Cot ( $\pi x$ )	Cos ( $\pi x$ )
.00 or 1.00	.00000	.00000	inf	1.00000
.01 .99	.03141	.03143	31.821	.99951
.02 .98	.06279	.06291	15.895	.99803
.03 .97	.09411	.09453	10.579	.99556
.04 .96	.12533	.12633	7.9158	.99211
.05 .95	.15643	.15838	6.3138	.98769
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.46 .54	.99211	7.9158	.12633	.12533
.47 .53	.99556	10.579	.09453	.09411
.48 .52	.99803	15.895	.06291	.06279
.49 .51	.99951	31.821	.03143	.03141
.50 .50	1.0000	inf	.00000	.00000

## TRIGONOMETRIC FUNCTIONS

1.5.02455

Column headings are: Rad., Sin, Tan, Cot, Cos; row headings or radians are in the range .00 radian through 2.00 radians at intervals of .01 radian; entries are to five figures; 14 pages.

$x$	Sin	Tan	Cot	Cos	$x$	Sin	Tan	Cot	Cos
.00	.00000	.00000	∞	1.00000	.50	.47943	.54630	1.8305	.87758
.01	.01000	.01000	99.997	0.99995	.51	.48818	.55936	1.7878	.87274
.02	.02000	.02000	49.993	.99980	.52	.49688	.57256	1.7465	.86782
.03	.03000	.03001	33.323	.99955	.53	.50553	.58592	1.7067	.86281
.04	.03999	.04002	24.987	.99920	.54	.51414	.59943	1.6683	.85771
.05	.04998	.05004	19.983	.99875	.55	.52269	.61311	1.6310	.85252

1.45	.99271	8.2381	.12139	.12050	1.95	.92896	-.2.5095	-.39849	-.37018
1.46	.99387	8.9886	.11125	.11057	1.96	.92521	-.2.4383	-.41012	-.37945
1.47	.99492	9.8874	.10114	.10063	1.97	.92137	-.2.3705	-.42185	-.38868
1.48	.99588	10.983	.09105	.09067	1.98	.91744	-.2.3058	-.43368	-.39788
1.49	.99674	12.350	.08097	.08071	1.99	.91341	-.2.2441	-.44562	-.40703
1.50	.99749	14.101	.07091	.07074	2.00	.90930	-.2.1850	-.45766	-.41615

## VALUES OF FUNCTIONS OF NUMBERS

1.5.02645

Column headings are:  $t$ ,  $\sin t$ ,  $\cos t$ ,  $\tan t$ ,  $\cot t$ ,  $\sec t$ ,  $\csc t$ ; row headings under  $t$  range from .00 through 1.60 at intervals of .01; entries are tabulated to four figures for the most part; 11 pages.

$t$	$\sin t$	$\cos t$	$\tan t$	$\cot t$	$\sec t$	$\csc t$
.00	.0000	1.0000	.0000	.....	1.000	.....
.01	.0100	1.0000	.0100	99.997	1.000	100.00
.02	.0200	.9998	.0200	49.993	1.000	50.00
.03	.0300	.9996	.0300	33.323	1.000	33.34
.04	.0400	.9992	.0400	24.987	1.001	25.01
.05	.0500	.9988	.0500	19.983	1.001	20.01

1.55	.9998	.0208	48.078	.0208	48.089	1.000
1.56	.9999	.0108	92.620	.0108	92.626	1.000
1.57	1.0000	.0008	1255.8	.0008	1255.8	1.000
1.58	1.0000	-.0092	-108.65	-.0092	-108.65	1.000
1.59	.9998	-.0192	-52.067	-.0192	-52.08	1.000
1.60	.9996	-.0292	-34.233	-.0292	-34.25	1.000
$t$	$\sin t$	$\cos t$	$\tan t$	$\cot t$	$\sec t$	$\csc t$

## TRIGONOMETRIC FUNCTIONS

1.5.03431

Column headings are: Degrees, Radians, Sin, Tan, Cot, Cos; column footings are: Cos, Cot, Tan, Sin, Radians, Degrees; row headings under Degrees range from  $0^\circ$  through  $90^\circ$  at intervals of  $1^\circ$ ; radians as well as all other entries are tabulated to three decimal places; 3 pages.

Degrees	Radians	Sin	Tan	Cot	Cos	Degrees
$0^\circ$	.000	.000	.000	1.000	1.571	$90^\circ$
$1^\circ$	.017	.017	.017	57.29	1.000	$89^\circ$
$2^\circ$	.035	.035	.035	28.64	.999	$88^\circ$
$3^\circ$	.052	.052	.052	19.081	.999	$87^\circ$
$4^\circ$	.070	.070	.070	14.301	.998	$86^\circ$
$5^\circ$	.087	.087	.087	11.430	.996	$85^\circ$

$40^\circ$	.698	.643	.839	1.192	.766	.873	$50^\circ$
$41^\circ$	.716	.656	.869	1.150	.755	.855	$49^\circ$
$42^\circ$	.733	.669	.900	1.111	.743	.838	$48^\circ$
$43^\circ$	.750	.682	.933	1.072	.731	.820	$47^\circ$
$44^\circ$	.768	.695	.966	1.036	.719	.803	$46^\circ$
$45^\circ$	.785	.707	1.000	1.000	.707	.785	$45^\circ$
	Cos	Cot	Tan	Sin	Radians	Degrees	

## TRIGONOMETRIC FUNCTIONS OF SOME PARTICULAR ANGLES

## 1.5.03440

Column headings are:  $\theta$ ,  $\theta$  in radians,  $\sin \theta$ ,  $\cos \theta$ ,  $\tan \theta$ ,  $\operatorname{ctn} \theta$ ,  $\sec \theta$ ,  $\csc \theta$ , row headings under  $\theta$  range from  $0^\circ$  through  $360^\circ$  at intervals of  $15^\circ$ ; the  $\theta$  in radians column has two subheadings, the first of which expresses  $\theta$  in multiples of  $\pi$ , and the second of which expresses  $\theta$  in the form  $x.\text{xxxx}$ ; other entries are tabulated either exactly or to four decimal places; 4 pages.

$\theta$	$\theta$ in radians	$\sin \theta$	$\cos \theta$	$\tan \theta$	$\operatorname{ctn} \theta$	$\sec \theta$	$\csc \theta$
$0^\circ$	0	0	1	0	—	1	—
$15^\circ$	$\pi/12$	0.2618	0.2588	0.9659	0.2679	3.7321	1.0353
$30^\circ$	$\pi/6$	0.5236	0.5	0.8660	0.5774	1.7321	1.1547
$45^\circ$	$\pi/4$	0.7854	0.7071	0.7071	—	—	1.4142
$60^\circ$	$\pi/3$	1.0472	0.8660	0.5	1.7321	0.5774	2
$75^\circ$	$5\pi/12$	1.3090	0.9659	0.2588	3.7321	0.2679	1.1547
$90^\circ$	$\pi/2$	1.5708	1	0	—	0	1.0353

$270^\circ$	$3\pi/2$	4.7124	-1	0	—	0	—	-1
$285^\circ$	$19\pi/12$	4.9742	-0.9659	0.2588	-3.7321	-0.2679	3.8637	-1.0353
$300^\circ$	$5\pi/3$	5.2360	-0.8660	0.5	-1.7321	-0.5774	2	-1.1547
$315^\circ$	$7\pi/4$	5.4978	-0.7071	0.7071	-1	-1	1.4142	-1.4142
$330^\circ$	$11\pi/6$	5.7596	-0.5	0.8660	-0.5774	-1.7321	1.1547	-2
$345^\circ$	$23\pi/12$	6.0214	-0.2588	0.9659	-0.2679	-3.7321	1.0353	-3.8637
$360^\circ$	$2\pi$	6.2832	0	1	0	—	1	—

## VALUES OF TRIGONOMETRIC FUNCTIONS

## 1.5.03441

Column headings are:  $\theta$ ,  $\theta$  rad,  $\sin \theta$ ,  $\cos \theta$ ,  $\tan \theta$ ,  $\operatorname{ctn} \theta$ ,  $\theta$  rad,  $\theta$ ; column footings are:  $\theta$ ,  $\theta$  rad,  $\cos \theta$ ,  $\sin \theta$ ,  $\operatorname{ctn} \theta$ ,  $\tan \theta$ ,  $\theta$  rad,  $\theta$ ; row headings under  $\theta$  range from  $0^\circ$  through  $90^\circ$  at intervals of  $1^\circ$ ; entries headed  $\operatorname{ctn} \theta$  are tabulated to four significant figures; entries under remaining headings are tabulated to four decimal places; 3 pages.

$\theta$	$\theta$ , rad	$\sin \theta$	$\cos \theta$	$\tan \theta$	$\operatorname{ctn} \theta$	$\theta$ , rad	$\theta$
0	.0000	.0000	1.0000	.0000	$\infty$	1.5708	90
1	.0175	.0175	.9998	.0175	57.29	1.5533	89
2	.0349	.0349	.9994	.0349	28.64	1.5359	88
3	.0524	.0523	.9986	.0524	19.08	1.5184	87
4	.0698	.0698	.9976	.0699	14.30	1.5010	86
5	.0873	.0872	.9962	.0875	11.430	1.4835	85

40	.6981	.6428	.7660	.8391	1.192	0.8727	50
41	.7156	.6561	.7547	.8693	1.150	0.8552	49
42	.7330	.6691	.7431	.9004	1.111	0.8378	48
43	.7505	.6820	.7314	.9325	1.072	0.8203	47
44	.7679	.6947	.7193	.9657	1.036	0.8029	46
45	7854	.7071	.7071	1.0000	1.000	0.7854	45

$\theta$	$\theta$ , rad	$\cos \theta$	$\sin \theta$	$\operatorname{ctn} \theta$	$\tan \theta$	$\theta$ , rad	$\theta$
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## TABLE OF THE SIX NATURAL TRIGONOMETRIC FUNCTIONS

## 1.5.03641

Column headings are: Angle, Sine, Cosine, Tangent, Cotangent, Secant, Cosecant; Angle has two subheadings - Degrees, Radians; row headings under Degrees range from  $0^\circ$  through  $90^\circ$  at intervals of  $1^\circ$ ; entries under Secant and Cosecant are to three decimal places for the most part; all other entries in remaining columns are tabulated to four decimals; 12 pages.

ANGLE		SINE	COSINE	TANGENT	COTANGENT	SECANT	COSECANT
Degrees	Radians						
$0^\circ$	.0000	.0000	1.0000	.0000	undefined	1.000	undefined
$1^\circ$	.0175	.0175	.9945	.0175	57.2900	1.000	57.30
$2^\circ$	.0349	.0349	.9801	.0349	28.6363	1.001	28.65
$3^\circ$	.0524	.0523	.9619	.0524	19.0811	1.001	19.11
$4^\circ$	.0698	.0698	.9397	.0699	14.3007	1.002	14.34
$5^\circ$	.0873	.0872	.9062	.0875	11.4301	1.004	11.47
$85^\circ$	1.4835	.9962	.0872	11.4301	.0875	11.47	1.004
$86^\circ$	1.5010	.9976	.0698	14.3007	.0699	14.34	1.002
$87^\circ$	1.5184	.9986	.0523	19.0811	.0524	19.11	1.001
$88^\circ$	1.5359	.9994	.0349	28.6363	.0349	28.65	1.001
$89^\circ$	1.5533	.9998	.0175	57.2900	.0175	57.30	1.000
$90^\circ$	1.5708	1.0000	0.0000	—	.0000	undefined	1.000

## VALUES OF TRIGONOMETRIC FUNCTIONS

## 1.5.03643

Column headings are: Degrees, Radians, Sin, Csc, Tan, Cot, Sec, Cos; column footings are: Cos, Sec, Cot, Tan, Csc, Sin, Radians, Degrees; Row headings under Degrees range from  $0^\circ 0'$  through  $90^\circ 0'$  at intervals of  $10'$ ; entries in columns headed Csc, Cot, Sec, are significant to four figures; entries in all other columns are tabulated to four decimal places; 30 pages.

Degrees	Radians	Sin	Csc	Tan	Cot	Sec	Cos	$1.5708$	$90^\circ 0'$
$0^\circ 0'$	.0000	.0000	—	.0000	—	1.000	1.0000		
$10'$	.029	.029	343.8	.029	343.8	.000	.000	.679	$50'$
$20'$	.058	.058	171.9	.058	171.9	.000	.000	.650	$40'$
$30'$	.087	.087	114.6	.087	114.6	1.000	1.0000	1.5621	$30'$
$40'$	.116	.116	85.95	.116	85.94	.000	.9999	.592	$20'$
$50'$	.145	.145	68.76	.145	68.75	.000	.999	.563	$10'$
$1^\circ 0'$	.0175	.0175	57.30	.0175	57.29	1.000	.9998	1.5533	$89^\circ 0'$

$44^\circ 0'$	.7679	.6947	1.440	.9657	1.036	1.390	.7193	.8029	$46^\circ 0'$
$10'$	.709	.967	.435	.718	.030	.394	.173	.999	$50'$
$20'$	.738	.988	.431	.770	.024	.398	.153	.970	$40'$
$30'$	.7767	.7009	1.427	.9827	1.018	1.402	.7133	.7941	$30'$
$40'$	.796	.030	.423	.884	.012	.406	.112	.912	$20'$
$50'$	.825	.050	.418	.942	.006	.410	.092	.883	$10'$
$45^\circ 0'$	.7854	.7071	1.414	1.000	1.000	1.414	.7071	.7854	$45^\circ 0'$
		Cos	Sec		Cot	Tan	Csc	Radians	Degrees

## TRIGONOMETRIC FUNCTIONS WITH RADIAN MEASURE

## 1.5.04345

Column headings are: rdn, dg min, sin, cos, tan; row headings under rdn range from .00 radian through 1.59 radians at intervals of .01 radian; degrees and minutes are tabulated as integers; entries headed sin and cos are tabulated to four decimal places; entries headed tan are to four decimal places in the range .00 through 1.47 radians, and to five significant figures in the range 1.48 through 1.59 radians; 11 pages.

Rdn.	Degrees	sin	cos	tan	Rdn.	Degrees	sin	cos	tan
.00	0°00'	0.0000	1.0000	0.0000	.40	22°55'	3894	.9211	.4228
.01	0°34'	.0100	.9999	.0100	.41	23°30'	3986	.9171	.4346
.02	1°09'	.0200	.9998	.0200	.42	24°04'	4078	.9131	.4466
.03	1°43'	.0300	.9996	.0300	.43	24°38'	4169	.9090	.4586
.04	2°18'	.0400	.9992	.0400	.44	25°13'	4259	.9048	.4708
.05	2°52'	.0500	.9988	.0500	.45	25°47'	4350	.9004	.4831
.06	3°26'	.0600	.9972	.0601	.46	26°21'	4440	.8960	.4954

1 15	65°53'	9128	4085 2.2345	1.55	88°48'	.9998	.0208	48.078
1 16	66°28'	9168	3993 2.2958	1.56	89°23'	.9999	.0108	92.620
1 17	67°02'	9208	3902 2.3600	1.57	89°57'	1.0000	.0008	1255.8
1 18	67°36'	9246	3809 2.4273	1.58	90°32'	1.0000	-.0092	-108.65
1 19	68°11'	9284	3717 2.4979	1.59	91°06'	.9998	-.0192	-52.067

## VALUES OF CIRCULAR FUNCTIONS

## 1.5.04645

Column headings are: Real Number x or  $\theta$  radians,  $\theta$  degrees, sin x or sin  $\theta$ , csc x or csc  $\theta$ , tan x or tan  $\theta$ , cot x or cot  $\theta$ , sec x or sec  $\theta$ , cos x or cos  $\theta$ ; row headings under first column range from 0.00 radian through 1.57 radians at intervals of .01 radian; entries headed degrees are expressed in degrees and minutes, entries in all other columns contain four figures; 22 pages.

Real Number x or $\theta$ radians	$\theta$ degrees	sin x or sin $\theta$	csc x or csc $\theta$	tan x or tan $\theta$	cot x or cot $\theta$	sec x or sec $\theta$	cos x or cos $\theta$
0.00	0° 00'	0.0000	No value	0.0000	No value	1.000	1.000
.01	0° 34'	.0100	100.0	.0100	100.0	1.000	1.000
.02	1° 09'	.0200	50.00	.0200	49.99	1.000	0.9998
.03	1° 43'	.0300	33.34	.0300	33.32	1.000	0.9996
.04	2° 18'	.0400	25.01	.0400	24.99	1.001	0.9992
0.05	2° 52'	0.0500	20.01	0.0500	19.98	1.001	0.9988

1.50	85° 57'	0.9975	1.003	14.10	0.0709	14.14	0.0707
1.51	86° 31'	.9982	1.002	16.43	.0609	16.46	.0608
1.52	87° 05'	.9987	1.001	19.67	.0508	19.69	.0508
1.53	87° 40'	.9992	1.001	24.50	.0408	24.52	.0408
1.54	88° 14'	.9995	1.000	32.46	.0308	32.48	.0308
1.55	88° 49'	0.9998	1.000	48.08	0.0208	48.09	0.0208
1.56	89° 23'	.9999	1.000	92.62	.0108	92.63	.0108
1.57	89° 57'	1.000	1.000	1256	.0008	1256	.0008

## TRIGONOMETRIC FUNCTIONS AND THEIR LOGARITHMS

## 1.5.11443

Column headings are: dg min, sin, log sin, cos, log cos, tan, log tan, cot, log cot, dg min; footings are: dg min, cos, log cos, sin, log sin, cot, log cot, tan, log tan, dg min; row headings under dg min range from  $0^{\circ}00'$  through  $90^{\circ}00'$  at intervals of  $10'$ ; values headed cot are significant to five figures; all other entries are tabulated to four decimal places; log cot characteristics are true; other logs are excess-10; 30 pages.

Angles	Sines		Cosines		Tangents		Cotangents		Angles
	Nat.	Log.	Nat.	Log.	Nat.	Log.	Nat.	Log.	
$0^{\circ}00'$	.0000	$\infty$	1.0000	0.0000	.0000	$\infty$	$\infty$	$\infty$	$90^{\circ}00'$
10	.0029	7.4637	1.0000	0.0000	.0029	7.4637	343.77	2.5363	50
20	.0058	.7648	1.0000	0.0000	.0058	.7648	171.89	2.352	40
30	.0087	.9408	1.0000	0.0000	.0087	.9409	114.59	0.591	30
40	.0116	8.0658	.9999	0.0000	.0116	8.0658	85.940	1.9342	20
50	.0145	.1627	.9999	0.0000	.0145	.1627	68.750	8.373	10
$1^{\circ}00'$	.0175	8.2419	.9998	9.9999	.0175	8.2419	57.290	1.7581	$89^{\circ}00'$
$44^{\circ}00'$	.6917	9.8418	.7193	9.8569	.9657	9.9848	1.0355	0.0152	$46^{\circ}00'$
10	.6967	.8431	.7173	.8557	.9713	.9874	1.0295	.0126	50
20	.6988	.8444	.7153	.8545	.9770	.9899	1.0235	.0101	40
30	.7009	.8457	.7133	.8532	.9827	.9924	1.0176	.0076	30
40	.7030	.8469	.7112	.8520	.9884	.9949	1.0117	.0051	20
50	.7050	.8482	.7092	.8507	.9942	.9975	1.0058	.0025	10
$45^{\circ}00'$	.7071	9.8495	.7071	9.8495	1.0000	0.0000	1.0000	0.0000	$45^{\circ}00'$
	Nat.	Log.	Nat.	Log.	Nat.	Log.	Nat.	Log.	
Angles	Cosines		Sines		Cotangents		Tangents		Angles

## TRIGONOMETRIC FUNCTIONS AND THEIR LOGARITHMS

## 1.5.13443

Column headings are: dg min, rdn, sin, log sin, cos, log cos, tan, log tan, cot, log cot; footings are: cos, log cos, sin, log sin, cot, log cot, tan, log tan, rdn, dg min; row headings under dg min range from  $0^{\circ}00'$  through  $90^{\circ}00'$  at intervals of  $10'$ ; entries headed cot are significant to five figures; all other entries including rdn are listed to four decimal places; log cot characteristics are true; other log entries are excess-10; 60 pages.

Degrees-Radians	Sine Value	Log	Cosine Value	Log	Tangent Value	Log	Cotangent Value	Log	Radians dg. min.
$0^{\circ}00'$	.0000	—	1.0000	0.0000	.0000	—	—	—	$1.5708 \quad 90^{\circ}00'$
10	.0029	7.4637	1.0000	0.0000	.0029	7.4637	343.77	2.5363	$1.5679 \quad 50$
20	.0058	.7648	1.0000	0.0000	.0058	.7648	171.89	2.352	$1.5650 \quad 40$
30	.0087	.9408	1.0000	0.0000	.0087	.9409	114.59	0.591	$1.5621 \quad 30$
40	.0116	8.0658	.9999	0.0000	.0116	8.0658	85.940	1.9342	$1.5592 \quad 20$
50	.0145	.1627	.9999	0.0000	.0145	.1627	68.750	8.373	$1.5563 \quad 10$
$1^{\circ}00'$	.0175	8.2419	.9998	9.9999	.0175	8.2419	57.290	1.7581	$1.5533 \quad 80^{\circ}00'$
$44^{\circ}00'$	.69479	9.8418	.71939	9.8569	.96579	9.9848	1.0355	0.0152	$.8029 \quad 46^{\circ}00'$
10	.6967	.8431	.7173	.8557	.9713	.9874	1.0295	.0126	$.7999 \quad 50$
20	.6988	.8444	.7153	.8545	.9770	.9899	1.0235	.0101	$.7970 \quad 40$
30	.7009	.8457	.7133	.8532	.9827	.9924	1.0176	.0076	$.7941 \quad 30$
40	.7030	.8469	.7112	.8520	.9884	.9949	1.0117	.0051	$.7912 \quad 20$
50	.7050	.8482	.7092	.8507	.9942	.9975	1.0058	.0025	$.7883 \quad 10$
$45^{\circ}00'$	.70719	9.8495	.70719	9.8495	.0007	10.000	1.0000	0.0000	$.7854 \quad 45^{\circ}00'$
	Value	Log	Value	Log	Value	Log	Value	Log	Radians Degrees
	Cosine		Sine		Cotangent		Tangent		

## LOGARITHMS OF TRIGONOMETRIC FUNCTIONS

1.5.21357

This table ranges from  $0^{\circ}0'0''$  through  $90^{\circ}0'0''$ ; from  $0^{\circ}$  through  $1^{\circ}$  and from  $88^{\circ}$  through  $90^{\circ}$  intervals are  $10''$ ; from  $1^{\circ}$  through  $89^{\circ}$  intervals are  $1'$ ; angles less than or equal to  $45^{\circ}$  are listed in leftmost column and angles greater than or equal to  $45^{\circ}$  are listed in the rightmost column; column headings are: log sin, log cos, log tan; corresponding footings are: log cos, log sin, log ctn; with the start of the  $1'$  intervals, log ctn appears as a fourth heading, while log tan is added as a column footing; entries are tabulated with an excess-10 characteristic, followed by a five-place mantissa; 217 pages (3 volumes).

 $0^{\circ}$ 

$1''$	log sin	log cos	log tan	$1''$	$1''$	log sin	log cos	log tan	$1''$
0 0	—	10.00000	—	60 0	10 0	7.46 373	10.00000	7.46 373	50 0
10	5.68 557	10.00000	5.68 557	50	10	7.47 090	10.00000	7.47 091	50
20	5.98 660	10.00000	5.98 660	40	20	7.47 797	10.00000	7.47 797	40
30	6.16 270	10.00000	6.16 270	30	30	7.48 491	10.00000	7.48 492	30
40	6.28 763	10.00000	6.28 763	20	40	7.49 175	10.00000	7.49 176	20
50	6.38 454	10.00000	6.38 454	10	50	7.49 849	10.00000	7.49 849	10
1 0	6.46 373	10.00000	6.46 373	59 0	11 0	7.50 512	10.00000	7.50 512	49 0

9 0	7.41 797	10.00000	7.41 797	51 0	19 0	7.74 24S	9.99 999	7.74 24S	41 0
10	7.42 594	10.00000	7.42 594	50	10	7.74 627	9.99 999	7.74 627	50
20	7.43 376	10.00000	7.43 376	40	20	7.75 003	9.99 999	7.75 004	40
30	7.44 145	10.00000	7.44 145	30	30	7.75 376	9.99 999	7.75 377	30
40	7.44 900	10.00000	7.44 900	20	40	7.75 745	9.99 999	7.75 746	20
50	7.45 643	10.00000	7.45 643	10	50	7.76 112	9.99 999	7.76 113	10
100	7.46 373	10.00000	7.46 373	50 0	20 0	7.76 475	9.99 999	7.76 476	40 0
$1''$	log cos	log sin	log ctn	$1''$	$1''$	log cos	log sin	log ctn	$1''$

 $89^{\circ}$  $1^{\circ}$ 

$1$	log sin	log cos	log tan	log ctn	$1$
0	24 186	99 993	24 192	75 808	60
1	24 903	99 993	24 910	75 090	59
2	25 609	99 993	25 616	74 384	58
3	26 304	99 993	26 312	73 688	57
4	26 988	99 992	26 996	73 004	56
5	27 661	99 992	27 669	72 331	55

 $2^{\circ}$ 

$1$	log sin	log cos	log tan	log ctn	$1$
0	54 282	99 974	54 308	45 692	60
1	54 642	99 973	54 669	45 331	59
2	54 999	99 973	55 027	44 973	58
3	55 354	99 972	55 382	44 618	57
4	55 705	99 972	55 734	44 266	56
5	56 054	99 971	56 083	43 917	55

55	84 112	85 754	98 357	01 643	5
56	125	742	383	617	4
57	138	730	408	592	3
58	151	718	433	567	2
59	164	706	458	542	1
60	84 177	85 693	98 494	01 516	0
	9	9	9	10	
	log cos	log sin	log ctn	log tan	$1$

55	84 855	85 012	99 874	00 126	5
56	898	84 999	899	101	4
57	911	986	924	076	3
58	923	974	949	051	2
59	936	961	975	025	1
60	84 949	84 949	00 000	00 000	0
	9	9	10	10	
	log cos	log sin	log ctn	log tan	$1$

 $46^{\circ}$  $45^{\circ}$

## LOGARITHMS OF TRIGONOMETRIC FUNCTIONS

1.5.21443

Column headings are: log sin, log tan, log cot, log cos; footings are: log cos, log cot, log tan, log sin; row headings in leftmost column range from  $0^{\circ}00'$  through  $45^{\circ}$  at intervals of  $10'$ ; row headings in rightmost column range from  $45^{\circ}00''$  through  $90^{\circ}00''$  at like intervals; each entry is expressed as excess-10, followed by a four-place mantissa; 16 pages.

→	L Sin	L Tan	L Cot	L Cos	←
$0^{\circ}00'$				10.0000	$90^{\circ}00''$
10'	7.4637	7.4637	12.5363	.0000	$89^{\circ}50'$
20'	.7648	.7648	.2352	.0000	40'
30'	7.9408	7.9409	12.0591	.0000	30'
40'	8.0658	8.0658	11.9342	.0000	20'
0°50'	.1627	.1627	.8373	10.0000	10'
1°00'	8.2419	8.2419	11.7581	9.9999	$89^{\circ}00''$
10'	.8431	.9874	.0126	.8557	$45^{\circ}50'$
20'	.8444	.9899	.0101	.8545	40'
30'	.8457	.9924	.0076	.8532	30'
40'	.8469	.9949	.0051	.8520	20'
44°50'	.8482	.9975	.0025	.8507	10'
45°00'	9.8495	10.0000	10.0000	9.8495	$45^{\circ}00'$
	L Cos	L Cot	L Tan	L Sin	←

## LOGARITHMS OF TRIGONOMETRIC FUNCTIONS

1.5.21444

Column headings are: Deg., log sin, log tan, log cot, log cos, Deg.; footings are: Deg., log cos, log cot, log tan, log sin, Deg.; row headings under Deg. range from  $0.0^{\circ}$  through  $90.0^{\circ}$  at intervals of  $.1^{\circ}$ ; leftmost column reading down -  $0^{\circ}$  through  $45^{\circ}$ , and rightmost column reading up -  $45^{\circ}$  through  $90^{\circ}$ ; entries headed log sin and log tan contain excess-10 characteristics followed by four-place mantissas; entries headed log cot and log log cos contain true characteristics followed by four-place mantissas; 30 pages.

Deg.	L.Sin	L.Tan	L.Cot	L.Cos	Deg.
0.0				0.0000	90.0
0.1	7.2419	7.2419	2.7581	0.0000	89.9
0.2	7.5429	7.5429	2.4571	0.0000	89.8
0.3	7.7190	7.7190	2.2810	0.0000	89.7
0.4	7.8439	7.8439	2.1561	0.0000	89.6
0.5	7.9408	7.9409	2.0591	0.0000	89.5
44.6	9.8464	9.9939	0.0061	9.8525	45.4
44.7	9.8472	9.9955	0.0045	9.8517	45.3
44.8	9.8480	9.9970	0.0030	9.8510	45.2
44.9	9.8487	9.9985	0.0015	9.8502	45.1
45.0	9.8495	0.0000	0.0000	9.8495	45.0
Deg.	L.Cos	L.Cot	L.Tan	L.Sin	Deg.

## LOGARITHMS OF SINES, COSINES, TANGENTS, AND COTANGENTS

1.5.21543

Column headings are: dg min, log sin, d, log cos, d, log tan, d, log cot; column footings are: log cos, d, log sin, d, log cot, d, log tan, dg min; row headings under dg min range from  $0^{\circ}0'$  through  $90^{\circ}0'$  at intervals of  $10'$ ; values in the log sin, log cos, and log tan columns contain excess-10 characteristics; values in the log cot column contain true characteristics; all logs have four-place mantissas; each d column is associated with the log column to its left; each value in a d column is spaced midway between the two values in the column immediately to its left and represents the difference between those two values, lower minus upper for the log sin and log tan, and upper minus lower for log cos; in braille, this value appears opposite the upper of the two values; 30 pages.

Angle	L Sin	d	L Cos	d	L Tan	d	L Cot	
$0^{\circ} 0'$	—		10.0000	0	—		—	$90^{\circ} 0'$
10'	7.4637		10.0000	0	7.4637	3011	2.5363	50'
20'	7.7648	3011	10.0000	0	7.7648	1761	2.2352	40'
30'	7.9408	1760	10.0000	0	7.9409	1249	2.0591	30'
40'	8.0658	1250	10.0000	0	8.0658	969	1.9342	20'
50'	8.1627	969	10.0000	1	8.1627	792	1.8373	10'
$1^{\circ} 0'$	8.2419		9.9999	0	8.2419	670	1.7581	$89^{\circ} 0'$
10'	8.3088	669	9.9999	0	8.3089	580	1.6911	50'
20'	8.3668	580	9.9999	0	8.3669	512	1.6331	40'
30'	8.4179	511	9.9999	1	8.4181	457	1.5819	30'
40'	8.4637	458	9.9998	1	8.4638	415	1.5362	20'
50'	8.5050	413	9.9998	0	8.5053	378	1.4947	10'
$2^{\circ} 0'$	8.5428		9.9997	1	8.5431	348	1.4569	$88^{\circ} 0'$
10'	8.5776	348	9.9997	0	8.5779	322	1.4221	50'
20'	8.6097	321	9.9996	1	8.6101	300	1.3899	40'
30'	8.6397	300	9.9996	0	8.6401	281	1.3599	30'
40'	8.6677	280	9.9995	1	8.6682	263	1.3318	20'
50'	8.6940	263	9.9995	0	8.6945	249	1.3055	10'
$3^{\circ} 0'$	8.7188	248	9.9994	1	8.7194	224	1.2806	$87^{\circ} 0'$

	L Cos	d	L Sin	d	L Cot	d	L Tan	Angle
$44^{\circ} 0'$	9.8418		9.8569	12	9.9848	26	0.0152	$46^{\circ} 0'$
10'	9.8431	13	9.8557	12	9.9874	26	0.0126	50'
20'	9.8444	13	9.8545	12	9.9899	25	0.0101	40'
30'	9.8457	13	9.8532	13	9.9924	25	0.0076	30'
40'	9.8469	12	9.8520	12	9.9949	25	0.0051	20'
50'	9.8482	13	9.8507	13	9.9975	26	0.0025	10'
$45^{\circ} 0'$	9.8495	13	9.8495	12	10.0000	25	0.0000	$45^{\circ} 0'$

## LOGARITHMS OF SINES, COSINES, TANGENTS, AND COTANGENTS

1.5.21543P

Angles are tabulated in degrees from  $0^{\circ}0'$  through  $90^{\circ}0'$  at intervals of  $10'$ ; column headings are: log sin, d, log cos, d, log tan, d, log cot; column footings are: log cos, d, log sin, d, log cot, d, log tan; values in the log sin, log cos, and log tan columns contain excess-10 characteristics; values in the log cot column contain true characteristics; mantissas in the log columns are to four decimal places; each d column is associated with the log column to its left; each value in a d column is spaced midway between the two values in the column immediately to its left and represents the difference between those two values, lower minus upper for log sin and log tan, and upper minus lower for log cos; in braille this value appears opposite the upper of the two values.

This tabulation is a proportional parts tabulation; column headings are differences (d) from 1 through 189; row headings are 0.1 through 0.9 at intervals of 0.1; values are tabulated in the form: n.x; a prefix page to this table contains angles tabulated from less than  $1^{\circ}$  through  $5^{\circ}$  at intervals of  $1^{\circ}$ ; columns are headed S and T; values are common logarithms with excess-10 characteristics and mantissas to four decimal places; 48 pages.

x	log sin	d	log cos	d	log tan	d	log cot	d	Small Angles
0° 0'	10.0000		10.0000		10.0000		10.0000		90° 0'
10' 7.4637	.0000	0	7.4637	.0000	3011	2.5353	50'	<1° 6.4637	6.4637
20' .7648	.0000	0	.7648	.0000	1760	.2352	40'	1° 6.4637	6.4638
30' .9408	.0000	0	.9408	.0000	1249	.0591	30'	2° 6.4636	6.4639
40' 8.0658	.0000	0	8.0658	.0000	969	1.9342	20'	3° 6.4635	6.4641
50' .1627	.0000	1	.1627	.0000	792	.8373	10'	4° 6.4634	6.4644
1° 0' 8.2419	669	9.9999	0	8.2419	670	1.7581	89° 0'	5° 6.4631	6.4649

-0'	.0t48	107	.997	2	.0678	108	.9522	20	99 98 97 96
50' .0755	104	.9969	1	.0786	105	.9214	10'	1 9.0 9.8 9.7 9.5	
0° 0' 9.0859	102	9.9968	2	9.0891	104	0.9109	83° 0'	2 19.8 19.6 19.4 19.0	
10' .0961	99	.9966	2	.0995	101	.9005	50'	3 29.7 29.4 29.1 28.5	
20' .1060	97	.9964	1	.1096	98	.8904	40'	4 39.6 39.2 38.8 38.0	
30' .1157		.9963		.1194		.8806	30'	5 49.5 49.0 48.5 47.5	
								6 59.4 58.8 58.2 57.0	
								7 69.3 68.6 67.9 66.5	
								8 79.2 78.4 77.6 76.0	
							x	9 89.1 88.2 87.3 85.5	
143	142	138	137	136	134	130	129	127	125 123 122 119 117 115 114
14.3	14.2	13.8	13.7	13.5	13.4	13.0	12.9	12.7	12.5 12.3 12.2 11.9 11.7 11.5 11.4
228.6	228.4	227.6	227.4	227.0	226.8	226.0	225.8	225.0	224.6 223.8 223.4 223.0 222.8
42.9	42.6	41.4	41.1	40.5	40.2	39.0	38.7	38.1	37.5 36.9 36.6 35.7 35.1 34.8 34.2
57.3	56.8	55.2	54.8	54.0	53.6	52.0	51.6	50.8	50.0 49.2 48.6 47.6 46.8 46.0 45.6
71.5	71.0	69.0	68.5	67.5	67.0	65.0	64.5	63.5	62.5 61.5 61.0 59.5 58.5 57.5 57.0
85.8	85.2	82.8	82.2	81.0	80.4	78.0	77.4	76.2	75.0 73.8 73.2 71.4 70.2 69.0 68.4
100.1	99.6	95.9	95.4	95.8	93.8	91.0	90.8	88.9	87.5 86.1 85.4 83.8 81.9 80.5 79.8
114.4	113.6	110.4	110.6	108.0	107.2	104.0	103.2	101.6	100.0 98.4 97.6 95.3 93.6 92.0 91.2
128.7	127.8	124.3	123.8	121.5	120.6	117.0	116.1	114.3	112.5 110.7 109.8 107.1 105.3 103.5 102.6

30'	8378	13	.8806	12	.9772	26	.0228	30'	11 10
40' 8391	14	.8594	12	.9798	25	.0202	20'	2 2.2 2.0	
50' 8405	13	.8582	13	.9823	25	0.0177	10'	3 3.2 3.0	
44° 0' 9.8418	13	9.8569	12	9.9848	26	0.0152	46° 0'	4 4.4 4.0	
10' 8431	13	.8557	12	.9874	25	.0126	50'	5 5.5 5.0	
20' 8444	13	.8545	13	.9899	25	.0101	40'	6 6.6 6.0	
30' 8457	12	.8532	12	.9924	25	.0076	30'	7 7.7 7.0	
40' 8469	13	.8520	13	.9949	26	.0051	20'	8 8.8 8.0	
50' 8482	13	.8507	12	.9975	25	.0025	10'	9 9.9 9.0	
45° 0' 9.8495		9.8495	0.0000			0.0000	45° 0'		
							x	Prop. Parts	

## PROPORTIONAL PARTS 1-189

## 1.5.P

Column headings are differences (d) from 1 through 189; row headings are 0.1 through 0.9 at intervals of 0.1; values are tabulated in the form n.x; this table combines with 1.5.21543 to form 1.5.21543P (previous page); 17 pages.

$\frac{d}{n}$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	$\frac{d}{n}$
0.1	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	0.1
0.2	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	0.2	1.8	2.0	2.2	2.4	2.6	2.8	0.2
0.3	0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	0.3	2.7	3.0	3.3	3.6	3.9	4.2	0.3
0.4	0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.2	0.4	3.6	4.0	4.4	4.8	5.2	5.6	0.4
0.5	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	0.5	4.5	5.0	5.5	6.0	6.5	7.0	0.5
0.6	0.6	1.2	1.8	2.4	3.0	3.6	4.2	4.8	0.6	5.4	6.0	6.6	7.2	7.8	8.4	0.6
0.7	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	0.7	6.3	7.0	7.7	8.4	9.1	9.8	0.7
0.8	0.8	1.6	2.4	3.2	4.0	4.8	5.6	6.4	0.8	7.2	8.0	8.8	9.6	10.4	11.2	0.8
0.9	0.9	1.8	2.7	3.6	4.5	5.4	6.3	7.2	0.9	8.1	9.0	9.9	10.8	11.7	12.6	0.9
	16	17	18	19	20	21	22	23		24	25	26	27	28	29	

$\frac{d}{n}$	178	179	180	181	182	183		184	185	186	187	188	189	
0.1	17.8	17.9	18.0	18.1	18.2	18.3	0.1	18.4	18.5	18.6	18.7	18.8	18.9	0.1
0.2	35.6	35.8	36.0	36.2	36.4	36.6	0.2	36.8	37.0	37.2	37.4	37.6	37.8	0.2
0.3	53.4	53.7	54.0	54.3	54.6	54.9	0.3	55.2	55.5	55.8	56.1	56.4	56.7	0.3
0.4	71.2	71.6	72.0	72.4	72.8	73.2	0.4	73.6	74.0	74.4	74.8	75.2	75.6	0.4
0.5	89.0	89.5	90.0	90.5	91.0	91.5	0.5	92.0	92.5	93.0	93.5	94.0	94.5	0.5
0.6	106.8	107.4	108.0	108.6	109.2	109.8	0.6	110.4	111.0	111.6	112.2	112.8	113.4	0.6
0.7	124.6	125.3	126.0	126.7	127.4	128.1	0.7	128.8	129.5	130.2	130.9	131.6	132.3	0.7
0.8	142.4	143.2	144.0	144.8	145.6	146.4	0.8	147.2	148.0	148.8	149.6	150.4	151.2	0.8
0.9	160.2	161.1	162.0	162.9	163.8	164.7	0.9	165.6	166.5	167.4	168.3	169.2	170.1	0.9

## LOGARITHMS OF TRIGONOMETRIC FUNCTIONS

## 1.5.21643

Column headings are: log sin, log tan, log cot, log cos, log csc, log sec; footings are: log cos, log cot, log tan, log sin, log sec, log csc; row headings (dg min) range from 0°00' through 90°00' at intervals of 10'; all entries are tabulated to four decimal places; 31 pages.

	L.Sin	L.Tan	L.Cot	L.Cos	Log Csc	L.Sec	
0 00				10.0000			90 00
10	7.4637	7.4637	12.5363	10.0000	12.5363	10.0000	50
20	7.7648	7.7648	12.2352	10.0000	12.2352	10.0000	40
30	7.9408	7.9409	12.0591	10.0000	12.0592	10.0000	30
40	8.0658	8.0658	11.9342	10.0000	11.9342	10.0000	20
50	8.1627	8.1627	11.8373	10.0000	11.8373	10.0000	10
1 00	8.2419	8.2419	11.7581	9.9999	11.7581	10.0001	89 00

44	00	9.8418	9.9843	10.0152	9.8569	10.1582	10.1451	40	50
10	9.8431	9.9874	10.0126	9.8557	10.1569	10.1443			50
20	9.8444	9.9899	10.0101	9.8545	10.1556	10.1455			40
30	9.8457	9.9924	10.0076	9.8532	10.1543	10.1468			30
40	9.8469	9.9949	10.0051	9.8520	10.1531	10.1480			20
50	9.8482	9.9975	10.0025	9.8507	10.1518	10.1493			10
45 00	9.8495	10.0000	10.0000	9.8495	10.1505	10.1505	45	00	
	L.Cos	L.Cot	L.Tan	L.Sin	L.Sec	L.Csc			

## LOGARITHMS OF TRIGONOMETRIC FUNCTIONS

1.5.23343

Column headings are: dg, rad, log sin, log cos, log tan, log cot; footings are: log cos, log sin, log cot, log tan, rad, dg; row headings under dg range from  $0^{\circ}00'$  through  $90^{\circ}00'$  at intervals of  $10'$ ; each log entry contains an excess-10 characteristic, followed by a four-place mantissa; radians are tabulated to four decimal places; 31 pages.

Deg.	Rad.	Log Sin $\theta$	Log Cos $\theta$	Log Tan $\theta$	Log Cot $\theta$		
$0^{\circ}00'$	.0000	—	10.0000	—	—	1.5708	$90^{\circ}00'$
10'	.0029	7.4637	10.0000	7.4637	12.5363	1.5679	50'
20'	.0058	7.7648	10.0000	7.7648	12.2352	1.5650	40'
30'	.0087	7.9408	10.0000	7.9409	12.0591	1.5621	30'
40'	.0116	8.0658	10.0000	8.0658	11.9342	1.5592	20'
50'	.0145	8.1627	10.0000	8.1627	11.8373	1.5563	10'
$1^{\circ}00'$	.0175	8.2419	9.9999	8.2419	11.7581	1.5533	$89^{\circ}00'$

$44^{\circ}00'$	.7679	9.8418	9.8569	9.9848	10.0152	.8029	$46^{\circ}00'$
.10'	.7709	9.8431	9.8557	9.9874	10.0126	.7999	50'
20'	.7738	9.8444	9.8545	9.9899	10.0101	.7970	40'
30'	.7767	9.8457	9.8532	9.9924	10.0076	.7941	30'
40'	.7796	9.8469	9.8520	9.9949	10.0051	.7912	20'
50'	.7825	9.8482	9.8507	9.9975	10.0025	.7883	10'
$45^{\circ}00' !$	.7854	9.8495	9.8495	10.0000	10.0000	.7854	$45^{\circ}00'$
		Log Cos $\theta$	Log Sin $\theta$	Log Cot $\theta$	Log Tan $\theta$	$\theta$ Rad.	$\theta$ Deg.

**NUMERICAL ANALYSIS****FACTORIALS****FACTORIALS OF INTEGERS****1.6.1063**

Column headings are: n, n!; n ranges from 1 through 50 at intervals of 1; n! is expressed as an integer for values of n from 1 through 9; for values of n from 10 through 50, n! is expressed in scientific notation whose precision part is of the form x.xxxxx and whose scale factor is the power of ten; 2 pages.

n	n!	n	n!
1	1	26	$4.03291 \times 10^{26}$
2	2	27	$1.08889 \times 10^{28}$
3	6	28	$3.04888 \times 10^{29}$
4	24	29	$8.84176 \times 10^{30}$
5	120	30	$2.65253 \times 10^{32}$

21	$5.10909 \times 10^{19}$	46	$5.50262 \times 10^{57}$
22	$1.12400 \times 10^{21}$	47	$2.58623 \times 10^{59}$
23	$2.58520 \times 10^{22}$	48	$1.24139 \times 10^{61}$
24	$6.20448 \times 10^{23}$	49	$6.08282 \times 10^{62}$
25	$1.55112 \times 10^{25}$	50	$3.04141 \times 10^{64}$

**LOGARITHMS OF FACTORIAL n****1.6.1157**

Column headings are: n, log n!; n ranges from 1 through 199 at intervals of 1; log n! has a characteristic and a five-digit mantissa; 4 pages.

n	log n!	n	log n!	n	log n!	n	log n!
1	0.00000	50	64.48307	100	157.97000	150	262.75689
2	0.30103	51	66.19064	101	159.97432	151	264.93587
3	0.77815	52	67.90665	102	161.98293	152	267.11771
4	1.38021	53	69.63092	103	163.99576	153	269.30241
5	2.07918	54	71.36332	104	166.01280	154	271.48993
		85	73.10368	105	168.03399	155	273.68026

45	56.07781	95	148.01410	145	251.90568	195	363.41362
46	57.74057	96	149.99637	146	254.07004	196	365.70587
47	59.41267	97	151.98314	147	256.23735	197	368.00034
48	61.09391	98	153.97437	148	258.40762	198	370.29701
49	62.78410	99	155.97000	149	260.58080	199	372.59586

## FACTORIALS AND THEIR LOGARITHMS

## 1.6.1342

Column headings are: n, p to four digits, log n!; n ranges from 1 through 60; p to four digits contains the four most significant digits of n! with the decimal point following the first digit; log n! contains a characteristic followed by a four-place mantissa; 3 pages.

For  $n! = p \cdot 10^k$ , k is the integral part of log n!

n	p to four digits	log n!	n	p to four digits	log n!	n	p to four digits	log n!
1	1.	0.00 00	21	5.1 09	19.70 83	41	3.3 45	49.52 44
2	2.	0.30 10	22	1.1 24	21.05 08	42	1.4 05	51.14 77
3	6.	0.77 82	23	2.5 85	22.41 25	43	6.0 42	52.78 11
4	2.4	1.38 02	24	6.2 04	23.79 27	44	2.6 58	54.42 46
5	1.20	2.07 92	25	1.5 51	25.19 06	45	1.1 96	56.07 78
6	7.20	2.85 73	26	4.0 33	26.60 56	46	5.5 03	57.74 06
14	8.7 18	10.94 04	34	2.9 52	38.47 02	54	2.3 08	71.36 33
15	1.3 08	12.11 65	35	1.0 33	40.01 42	55	1.2 70	73.10 37
16	2.0 92	13.32 06	36	3.7 20	41.57 05	56	7.1 10	74.85 19
17	3.5 57	14.55 11	37	1.3 76	43.13 87	57	4.0 53	76.60 77
18	6.4 02	15.80 63	38	5.2 30	44.71 85	58	2.3 51	78.37 12
19	1.2 16	17.08 51	39	2.0 40	46.30 96	59	1.3 87	80.14 20
20	2.4 33	18.38 61	40	8.1 59	47.91 16	60	8.3 21	81.92 02

## n! AND COMMON LOGARITHMS OF n!

## 1.6.1346

Column headings are: n, n!, Log n!; n ranges from 1 through 100 at intervals of 1; n! is expressed in scientific notation, the precision part being in the form x.xxxx, and the scale factor being expressed as a power of 10; Log n! is expressed as a characteristic followed by a four-place mantissa; 7 pages.

n	n!	Log n!	n	n!	Log n!
1	1.0000	0.0000	51	$1.5511 \times 10^{46}$	66.1906
2	2.0000	0.3010	52	$8.0658 \times 10^{47}$	67.9067
3	6.0000	0.7782	53	$4.2749 \times 10^{48}$	69.6309
4	$2.4000 \times 10^4$	1.3802	54	$2.3084 \times 10^{49}$	71.3633
5	$1.2000 \times 10^5$	2.0792	55	$1.2696 \times 10^{50}$	73.1037
46	$5.5026 \times 10^{57}$	57.7406	96	$9.9168 \times 10^{68}$	149.9964
47	$2.5862 \times 10^{58}$	59.4127	97	$9.6193 \times 10^{69}$	151.9831
48	$1.2414 \times 10^{59}$	61.0939	98	$9.4269 \times 10^{70}$	153.9744
49	$6.0828 \times 10^{60}$	62.7841	99	$9.3326 \times 10^{71}$	155.9700
50	$3.0414 \times 10^{61}$	64.4831	100	$9.3326 \times 10^{72}$	157.9700

## FACTORIALS AND THEIR LOGARITHMS

### 1.6.1355

Column headings are: n, n!; n ranges from 1 through 80 at intervals of 1; n! is expressed in scientific notation, the precision part is of the form x.xxxx, and the scale factor is expressed as a power of ten; log n! is expressed as a characteristic followed by a five-place mantissa; 6 pages.

n	n!	log n!	n	n!	log n!
1	1.0000	0.00000	41	$3.3453 \times 10^{40}$	49.52448
2	2.0000	0.30103	42	$1.4050 \times 10^{41}$	51.14768
3	6.0000	0.77815	43	$6.0415 \times 10^{41}$	52.78115
4	$2.4000 \times 10^3$	1.38021	44	$2.6583 \times 10^{42}$	54.42460
5	$1.2000 \times 10^3$	2.07918	45	$1.1962 \times 10^{43}$	56.07781
36	$3.7199 \times 10^{44}$	41.57054	76	$1.8855 \times 10^{111}$	111.27543
37	$1.3764 \times 10^{44}$	43.13874	77	$1.4518 \times 10^{111}$	118.16192
38	$5.2302 \times 10^{44}$	44.71852	78	$1.1324 \times 10^{111}$	115.05401
39	$2.0398 \times 10^{44}$	46.30959	79	$8.9462 \times 10^{111}$	116.95164
40	$8.1592 \times 10^{44}$	47.91165	80	$7.1569 \times 10^{111}$	118.85478

## FACTORIALS AND THEIR RECIPROCALS

### 1.6.1451

Column headings for the first block of the table are: n, n!; in the second block, headings are: n, 1/n!; values of n are from 1 through 20 at intervals of 1; values of n! are exact; values of 1/n! are expressed as five-place decimals times a power of ten; 2 pages.

n	n!	n	n!	n	1/n!	n	1/n!
1	1	11	39916800	1	1.	11	$.25052 \times 10^{-7}$
2	2	12	479001600	2	0.5	12	$.20877 \times 10^{-8}$
3	6	13	6227020800	3	.16667	13	$.16059 \times 10^{-9}$
4	24	14	87178291200	4	.41667 $\times 10^{-1}$	14	$.11471 \times 10^{-10}$
5	120	15	1307674368000	5	.83333 $\times 10^{-2}$	15	$.76472 \times 10^{-12}$
6	720	16	20922789888000	6	.13889 $\times 10^{-2}$	16	$.47795 \times 10^{-13}$
7	5040	17	355687428096000	7	.19841 $\times 10^{-3}$	17	$.28115 \times 10^{-14}$
8	40320	16	6402373705728000	8	.24802 $\times 10^{-4}$	18	$.15619 \times 10^{-15}$
9	362880	19	121645100408832000	9	.27557 $\times 10^{-5}$	19	$.82206 \times 10^{-17}$
10	3628800	20	2432902008176640000	10	.27557 $\times 10^{-6}$	20	$.41103 \times 10^{-18}$

## BINOMIAL COEFFICIENTS

## BINOMIAL COEFFICIENTS

1.6.220

Column headings are:  $\binom{n}{0} \binom{n}{1} \binom{n}{2} \binom{n}{3} \binom{n}{4} \binom{n}{5} \binom{n}{6} \binom{n}{7} \binom{n}{8} \binom{n}{9} \binom{n}{10}$ ;

Values of n are listed from 0 through 20 at intervals of 1; binomial coefficients are listed as exact values; 4 pages.

n	$\binom{n}{0}$	$\binom{n}{1}$	$\binom{n}{2}$	$\binom{n}{3}$	$\binom{n}{4}$	$\binom{n}{5}$	$\binom{n}{6}$	$\binom{n}{7}$	$\binom{n}{8}$	$\binom{n}{9}$	$\binom{n}{10}$
0	1										
1	1	1									
2	1	2	1								
3	1	3	3	1							
4	1	4	6	4	1						
5	1	5	10	10	5	1					
6	1	6	15	20	15	6	1				
7	1	7	21	35	35	21	7	1			
8	1	8	28	56	70	56	28	8	1		
16	1	16	120	560	1820	4368	8008	11440	12870	11440	8008
17	1	17	136	680	2380	6188	12376	19448	24310	24310	19448
18	1	18	153	816	3060	8658	18564	31824	43758	48620	43758
19	1	19	171	969	3876	11628	27132	50388	75582	92378	92378
20	1	20	190	1140	4845	15504	38760	77520	125970	167960	184756

BINOMIAL COEFFICIENTS PASCAL'S TRIANGLE  $\binom{n}{s}$ 

1.6.220A

Table I.6.220 is expanded to include ten additional columns headed 11 through 20 as defined by s; 6 pages.

n	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0	1																				
1	1	1																			
2	1	2	1																		
3	1	3	3	1																	
4	1	4	6	4	1																
5	1	5	10	10	5	1															
6	1	6	15	20	15	6	1														
7	1	7	21	35	35	21	7	1													
16	1	16	120	560	1,820	4,368	8,008	11,440	12,870	11,440	8,008	4,368	1,820	560	120	16	1				
17	1	17	136	680	2,380	6,188	12,376	19,448	24,310	24,310	19,448	12,376	6,188	2,380	680	136	17	1			
18	1	18	153	816	3,060	8,568	18,564	31,624	43,758	48,620	43,758	31,624	18,564	8,568	3,060	816	153	18	1		
19	1	19	171	969	3,876	11,628	27,132	60,388	75,582	92,378	92,378	75,582	50,388	27,132	11,628	3,876	969	171	19	1	
20	1	20	190	1,140	4,845	15,504	38,760	77,520	125,970	167,960	184,756	167,960	125,970	77,520	38,760	15,504	4,845	1,140	190	20	1

## 2. STATISTICS

### NORMAL CURVE, AREAS AND ORDINATES

#### AREAS UNDER THE STANDARD NORMAL CURVE

##### 2.1.30401

Columns are headed:  $z_\alpha$ ,  $z_{1-\alpha}$ ,  $\alpha$ ,  $1 - \alpha$ ,  $2\alpha$ ;  $\alpha$  represents the area under the normal curve from  $-\infty$  to  $z_\alpha$ ; the  $z_\alpha$  column is in the range from 0.0 through -4.0 at intervals of .1; entries in the  $z_{1-\alpha}$  column are in the range from 0.0 through 4.0 at intervals of .1; entries in the  $\alpha$ ,  $1 - \alpha$ , and  $2\alpha$  columns are tabulated to three decimal places for values of  $z_\alpha$  from 0.0 through -2.9, and to five decimal places for values of  $z_\alpha$  in the range from -3.0 through -4.0; 3 pages.

$z_\alpha$	$z_{1-\alpha}$	$\alpha$	$1 - \alpha$	$2\alpha$	$z_\alpha$	$z_{1-\alpha}$	$\alpha$	$1 - \alpha$	$2\alpha$
0	0	.500	.500	1.000	-2.1	2.1	.018	.982	.036
-.1	.1	.460	.540	.920	-2.2	2.2	.014	.986	.028
-.2	.2	.421	.579	.841	-2.3	2.3	.011	.989	.021
-.3	.3	.382	.618	.764	-2.4	2.4	.008	.992	.016
-.4	.4	.345	.655	.689	-2.5	2.5	.006	.994	.012
-.5	.5	.309	.691	.617	-2.6	2.6	.005	.995	.009

-1.5	1.5	.067	.933	.134	-3.6	3.6	.00016	.99984	.00032
-1.6	1.6	.055	.945	.110	-3.7	3.7	.00011	.99989	.00022
-1.7	1.7	.045	.955	.089	-3.8	3.8	.00007	.99993	.00014
-1.8	1.8	.036	.964	.072	-3.9	3.9	.00005	.99995	.00010
-1.9	1.9	.029	.971	.057	-4.0	4.0	.00003	.99997	.00006
-2.0	2.0	.023	.977	.046					

## PROBABILITIES IN A NORMAL DISTRIBUTION

2.1.3134

Column headings are: z, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9; values of z are listed from 0.00 through 3.29 at intervals of .01; the most significant part of z is a row heading, the least significant part is a column heading (the latter constituting the second decimal of the z listings); entries are to three decimal places, and represent the areas under the curve from 0 through z; 6 pages.

<i>z</i>	0	1	2	3	4	5	6	7	8	9
0.0	0.000	0.004	0.008	0.012	0.016	0.020	0.024	0.028	0.032	0.036
0.1	0.040	0.044	0.048	0.052	0.056	0.060	0.064	0.067	0.071	0.075
0.2	0.079	0.083	0.087	0.091	0.095	0.099	0.103	0.106	0.110	0.114
0.3	0.118	0.122	0.126	0.129	0.133	0.137	0.141	0.144	0.148	0.152
0.4	0.155	0.159	0.163	0.166	0.170	0.174	0.177	0.181	0.184	0.188
0.5	0.191	0.195	0.198	0.202	0.205	0.209	0.212	0.216	0.219	0.222
2.8	0.497	0.498	0.498	0.498	0.498	0.498	0.498	0.498	0.498	0.498
2.9	0.498	0.498	0.498	0.498	0.498	0.498	0.498	0.499	0.499	0.499
3.0	0.499	0.499	0.499	0.499	0.499	0.499	0.499	0.499	0.499	0.499
3.1	0.499	0.499	0.499	0.499	0.499	0.499	0.499	0.499	0.499	0.499
3.2	0.499	0.499	0.499	0.499	0.499	0.499	0.499	0.499	0.499	0.500

For all values of z greater than 3.29, the probability is 0.500 correct to three decimal places.

## PERCENTILE VALUES OF THE STANDARD NORMAL CURVE

2.1.32374

Column headings are: Area to the left of z, and z; entries in the Area to the left of z column range from .0001 through .0005 at intervals of .0001; from .001 through .010 at intervals of .001; from .010 through .100 at intervals of .005; from .100 through .900 at intervals of .020; from .900 through .990 at intervals of .005; from .990 through .999 at intervals of .001; additional entries in the same column are: .9995, .9996, .9999; entries are to three decimal places; 4 pages.

| Area<br>to the<br>left of<br><i>z</i> |
|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| .0001 - 3.719                         | .045 - 1.695                          | .280 - .583                           | .700 .524                             | .950 1.645                            |
| .0002 - 3.540                         | .050 - 1.645                          | .300 - .524                           | .720 .583                             | .955 1.695                            |
| .0003 - 3.432                         | .055 - 1.598                          | .320 - .468                           | .740 .643                             | .960 1.751                            |
| .0004 - 3.353                         | .060 - 1.555                          | .340 - .412                           | .750 .6745                            | .965 1.812                            |
| .0005 - 3.291                         | .065 - 1.514                          | .360 - .358                           | .760 .706                             | .970 1.881                            |
| 0.015 - 2.170                         | .180 - .915                           | .580 .202                             | .920 1.405                            | .997 2.748                            |
| .020 - 2.054                          | .200 - .842                           | .600 .253                             | .925 1.440                            | .998 2.878                            |
| .025 - 1.960                          | .220 - .772                           | .620 .305                             | .930 1.476                            | .999 3.090                            |
| .030 - 1.881                          | .240 - .706                           | .640 .358                             | .935 1.514                            | .9995 3.291                           |
| .035 - 1.812                          | .250 - .6745                          | .660 .412                             | .940 1.555                            | .9996 3.353                           |
| .040 - 1.751                          | .260 - .643                           | .680 .468                             | .945 1.598                            | .9999 3.719                           |

\* Entries in this table are taken from *The Kelley Statistical Tables*, Harvard University Press, 1938, revised 1948, by permission of the author, Truman Lee Kelley.

## NORMAL DISTRIBUTION

## 2.1.32645

Column headings are: z, p, h; row headings under z are from .00 through 2.95 at intervals of .05, from 3.00 through 4.50 at intervals of .50; entries are tabulated for the most part to three decimals, some to four; following the table are three short columns headed Fractiles; 3 pages.

<i>z</i>	<i>p</i>	<i>h</i>	<i>z</i>	<i>p</i>	<i>h</i>	<i>z</i>	<i>p</i>	<i>h</i>
.00	.500	.399	1.25	.106	.183	2.50	.006	.018
.05	.480	.398	1.30	.097	.171	2.55	.005	.015
.10	.460	.397	1.35	.089	.160	2.60	.005	.014
.15	.440	.394	1.40	.081	.150	2.65	.004	.012
.20	.421	.391	1.45	.074	.139	2.70	.003	.010

Fractiles								
.75	.227	.301	2.00	.023	.054	.253	.40	.386
.80	.212	.290	2.05	.020	.049	.431	.333	.364
.85	.198	.278	2.10	.018	.044	.524	.30	.348
.90	.184	.266	2.15	.016	.040	.674	.25	.318
.95	.171	.254	2.20	.014	.035	.842	.20	.280
1.00	.159	.242	2.25	.012	.032	1.282	.10	.176
1.05	.147	.230	2.30	.011	.028	1.645	.05	.103
1.10	.136	.218	2.35	.009	.025	1.960	.025	.058
1.15	.125	.206	2.40	.008	.022	2.326	.01	.027
1.20	.115	.194	2.45	.007	.020	2.576	.005	.014

## AREAS UNDER THE NORMAL CURVE

## 2.1.41301

Column headings are: z, .00, .01, .02, .03, .04, .05, .06, .07, .08, .09; values of z range from 0.00 through 3.09 at intervals of 0.01; the most significant part of z is a row heading with the least significant part of z a column heading; values are tabulated to four decimal places and represent the area under the curve from 0 to z; 4 pages.

<i>z</i>	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224

2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

## AREAS UNDER THE NORMAL CURVE

2.1.41301A

Column headings are: z, .00, .01, .02, .03, .04, .05, .06, .07, .08, .09; values of z range from 0.00 through 3.89 at intervals of .01; the most significant part of z is a row heading while the least significant part of z is a column heading; entries are tabulated to four decimal places and represent the area under the curve from 0 to z; 6 pages.

## AREAS UNDER THE NORMAL CURVE

2.1.41301B

Column headings are identical to above table; values of  $z$  are listed from 0.00 through 3.09 at intervals of 0.01, from 3.1 through 4.0 at intervals of 0.1; for the most part the most significant part of  $z$  is a row heading and the least significant part of  $z$  is a column heading; entries are tabulated to four decimal places in the range 0.00 through 3.09, and to five decimal places in the range 3.1 through 4.0; 5 pages.

## THE STANDARD NORMAL DISTRIBUTION.

### 2.1.41301N

Column headings are:  $z$  (to 1st decimal), .00, .01, .02, .03, .04, .05, .06, .07, .08, .09 (second decimal); values of  $z$  are listed from -3.09 through -0.09 at intervals of 0.01; the most significant part of  $z$  is a row heading while the least significant part of  $z$  is a column heading; entries are tabulated to four decimal places, and represent the area under the curve from  $-\infty$  to  $z$ ; 5 pages. (Drawing included)

$\frac{z}{\text{To 1st Decimal}}$	Second Decimal									
	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
Area										
-3.0	.0014	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
-2.9	.0019	.0013	.0013	.0017	.0016	.0016	.0015	.0015	.0014	.0014
-2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
-2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
-2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
-2.5	.0062	.0050	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
-0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
-0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
-0.7	.2420	.2389	.2358	.2327	.2297	.2266	.2236	.2206	.2177	.2148
-0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
-0.5	.3035	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
-0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
-0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
-0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
-0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
-0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641

## ORDINATES AND AREAS OF THE NORMAL CURVE

### 2.1.41303

Column headings are:  $\frac{x}{\sigma}$ , Area, Ordinate; entries in the  $\frac{x}{\sigma}$  column range from .00 through 3.00 at intervals of .01; values in the Area and Ordinate columns are tabulated to four decimal places; 10 pages.

$\frac{x}{\sigma}$	Area	Ordinate	$\frac{x}{\sigma}$	Area	Ordinate	$\frac{x}{\sigma}$	Area	Ordinate
.00	.0000	.3989	.00	.1915	.3521	1.00	.3413	.2420
.01	.0040	.3989	.01	.1950	.3403	1.01	.3438	.2306
.02	.0080	.3989	.02	.1985	.3483	1.02	.3461	.2271
.03	.0120	.3988	.03	.2019	.3407	1.03	.3483	.2247
.04	.0160	.3986	.04	.2054	.3448	1.04	.3508	.2223
.05	.0199	.3984	.05	.2088	.3420	1.05	.3531	.2200
.06	.0239	.3982	.06	.2123	.3410	1.06	.3554	.2275
.07	.0270	.3980	.07	.2157	.3391	1.07	.3577	.2251
.08	.0310	.3977	.08	.2190	.3372	1.08	.3599	.2227
.09	.0350	.3973	.09	.2224	.3352	1.09	.3621	.2203
1.95	.4744	.0596	2.45	.4929	.0198	2.95	.4984	.0051
1.96	.4750	.0584	2.40	.4931	.0194	2.00	.4985	.0050
1.97	.4756	.0573	2.47	.4932	.0189	2.97	.4985	.0048
1.98	.4761	.0562	2.48	.4934	.0184	2.98	.4986	.0047
1.99	.4767	.0551	2.49	.4936	.0180	2.99	.4986	.0046
2.00	.4772	.0540	2.50	.4938	.0175	3.00	.4987	.0044

\* This table is reproduced from J. E. Wert, *Educational Statistics*, by courtesy of McGraw-Hill Book Co.

## ORDINATES AND AREAS OF THE NORMAL CURVE

2.1.41303A

Column headings are:  $\frac{x}{\sigma}$ , Area, Ordinate; row headings under the  $\frac{x}{\sigma}$  column range from .00 through 3.89 at intervals of .01; entries in the Area and Ordinate columns are tabulated to four decimal places; 14 pages.

$\frac{x}{\sigma}$	Area	Ordinate
.00	.0000	.3989
.01	.0040	.3989
.02	.0080	.3989
.03	.0120	.3988
.04	.0160	.3986
.05	.0199	.3984
3.85	.4999	.0002
3.86	.4999	.0002
3.87	.5000	.0002
3.88	.5000	.0002
3.89	.5000	.0002

## STANDARD NORMAL DISTRIBUTION

2.1.41391

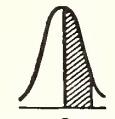
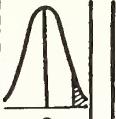
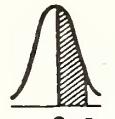
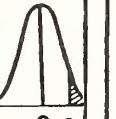
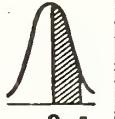
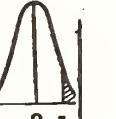
Column headings are  $z_0$ , .00, .01, .02, .03, .04, .05, .06, .07, .08, .09; values of  $z$  are listed from 0.00 through 3.99 at intervals of 0.01; the most significant part of  $z$  is a row heading while the least significant part of  $z$  is a column heading (second decimal); entries are tabulated to four decimal places and represent the area under the curve from 0 through  $z_0$ ; 7 pages.  
 (Drawing included)

$z_0$	Second decimal place of $z_0$									
	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224

## AREAS UNDER THE STANDARD NORMAL CURVE

## 2.1.41405

Column headings are: z, Area from 0 to z, Area from z to infinity; values of z range from 0.00 through 3.25 at intervals of 0.01, from 3.25 through 3.50 at intervals of 0.05, and from 3.50 through 4.00 at intervals of 0.1; entries are tabulated to four decimal places; 12 pages.

z					z					z				
	0	z	0	z		0	z	0	z		0	z	0	z
0.00	.0000	.5000	0.55	.2088	.2912	1.10	.3643	.1357						
0.01	.0040	.4960	0.56	.2123	.2877	1.11	.3665	.1335						
0.02	.0080	.4920	0.57	.2157	.2843	1.12	.3686	.1314						
0.03	.0120	.4880	0.58	.2190	.2810	1.13	.3708	.1292						
0.04	.0160	.4840	0.59	.2224	.2776	1.14	.3729	.1271						
2.10	.4821	.0179	2.67	.4962	.0038	3.24	.4994	.0006						
2.11	.4826	.0174	2.68	.4963	.0037	3.25	.4994	.0006						
2.12	.4830	.0170	2.69	.4964	.0036	3.30	.4995	.0005						
2.13	.4834	.0166	2.70	.4965	.0035	3.35	.4996	.0004						
2.14	.4838	.0162	2.71	.4966	.0034	3.40	.4997	.0003						
2.15	.4842	.0158	2.72	.4967	.0033	3.45	.4997	.0003						
2.16	.4846	.0154	2.73	.4968	.0032	3.50	.4998	.0002						
2.17	.4850	.0150	2.74	.4969	.0031	3.60	.4998	.0002						
2.18	.4854	.0146	2.75	.4970	.0030	3.70	.4999	.0001						
2.19	.4857	.0143	2.76	.4971	.0029	3.80	.4999	.0001						
2.20	.4861	.0139	2.77	.4972	.0028	3.90	.49995	.00005						
2.21	.4864	.0136	2.78	.4973	.0027	4.00	.49997	.00003						

Source: Runyon and Haber, *Fundamentals of Behavioral Statistics*, 1967, Addison-Wesley, Reading, Mass.

## AREAS AND ORDINATES OF THE NORMAL CURVE

## 2.1.41405A

Column headings are: (1) z, (2) Area from mean to z, (3) Area in larger portion, (4) Area in smaller portion, (5) Ord.; row headings under z are 0.00 through 3.24 at intervals of 0.01, from 3.30 through 3.70 at intervals of 0.10; entries are tabulated to four decimal places; 23 pages.

(1)	(2)	(3)	(4)	(5)
z	A	B	C	y
Standard score $\left(\frac{x}{\sigma}\right)$	Area from mean to $\frac{x}{\sigma}$	Area in larger portion	Area in smaller portion	Ordinate at $\frac{x}{\sigma}$
0.00	.0000	.5000	.5000	.3989
0.01	.0040	.5040	.4960	.3989
0.02	.0080	.5080	.4920	.3989
0.03	.0120	.5120	.4880	.3988
0.04	.0160	.5160	.4840	.3986

3.30	.4995	.9995	.0005	.0017
3.40	.4997	.9997	.0003	.0012
3.50	.4998	.9998	.0002	.0009
3.60	.4998	.9998	.0002	.0006
3.70	.4999	.9999	.0001	.0004

Source: A. L. Edwards, *Statistical Methods for the Behavioral Sciences*, New York: Holt, 1954. Reprinted by permission of author and publisher.

NORMAL CURVE AREAS BEYOND  $z$ 

## 2.1.41406

Column headings are:  $z$ , .00, .01, .02, .03, .04, .05, .06, .07, .08, .09; values of  $z$  range from 0.00 through 3.19 at intervals of .01 and from 3.1 through 4.0 at intervals of .1; for the most part the most significant part of  $z$  is a row heading and the least significant part of  $z$  is a column heading; entries are tabulated to four decimal places, the last six entries to five decimal places; 6 pages.

$z$	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641
.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
3.2	.0007									
3.3	.0005									
3.4	.0003									
3.5	.00023									
3.6	.00016									
3.7	.00011									
3.8	.00007									
3.9	.00005									
4.0	.00003									

VALUES OF  $z$  CORRESPONDING TO DIVISIONS OF THE AREA OF THE NORMAL CURVE INTO A LARGER AND A SMALLER PROPORTION

## 2.1.42994

Column headings are: Larger,  $z$ , Smaller; entries under column headed Larger range from .500 to .995 at intervals of .005, from .996 through .999 at intervals of .001; entries under column headed Smaller range from .500 decreasing to .005 at intervals of .005, and from .004 through .001 at intervals of .001; entries in  $z$  column range from .0000 through 3.2905, and are to four decimal places; 4 pages.

The larger area 1	$z$ 2	The smaller area 3
.500	.0000	.500
.505	.0125	.495
.510	.0251	.490
.515	.0376	.485
.520	.0502	.480
.996	2.6521	.004
.997	2.7478	.003
.998	2.8782	.002
.999	3.0902	.001
.9995	3.2905	.0001

## CUMULATIVE NORMAL FREQUENCY

## 2.1.51451N

Values of X are tabulated from 0.00 through -4.59 at intervals of .01 column headings are: X, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9; the most significant part of X is a row heading and the least significant part of X is a column heading; entries are tabulated to four decimal places and represent the cumulative frequency from  $-\infty$  to X; 7 pages.

$$Y_i = \frac{1}{\sqrt{2\pi}} e^{-x_i^2/2} \quad \text{summed over } X_i \leq X$$

X	0	1	2	3	4	5	6	7	8	9
-0.0	0.5 0000	*9601	*9202	*8803	*8405	*8006	*7608	*7210	*6812	*6414
-0.1	0.4 6017	5620	5224	4828	4433	4038	3644	3251	2858	2465
-0.2	0.4 2074	1683	1294	0905	0517	0129	*9743	*9358	*8974	*8591
-0.3	0.3 8209	7828	7448	7070	6693	6317	5942	5569	5197	4827
-0.4	4458	4090	3724	3360	2997	2636	2276	1918	1561	1207
-0.5	0.3 0854	0503	0153	*9806	*9460	*9116	*8774	*8434	*8096	*7760

-4.1	0002	0002	0002	0002	0002	0002	0002	0002	0001	0001
-4.2	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
-4.3	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
-4.4	0001	0001	0000	0000	0000	0000	0000	0000	0000	0000
-4.5	0.0 0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
X	0	1	2	3	4	5	6	7	8	9

## CUMULATIVE NORMAL FREQUENCY

## 2.1.51451P

Column headings are: X, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9; values of X are listed from 0.00 through 4.59 at intervals of .01; the most significant part of X is a row heading while the least significant part of X is a column heading; entries are tabulated to four decimals and represent the frequency from infinity to X; 7 pages.\*

$$Y_i = \frac{1}{\sqrt{2\pi}} e^{-x_i^2/2} \quad \text{summed over } X_i \leq X$$

X	0	1	2	3	4	5	6	7	8	9
0.0	0.5 0000	0399	0798	1197	1595	1994	2392	2790	3188	3586
0.1	3983	4380	4776	5172	5567	5962	6356	6749	7142	7535
0.2	0.5 7926	8317	8706	9095	9483	9871	*0257	*0642	*1026	*1409
0.3	0.6 1791	2172	2552	2930	3307	3683	4058	4431	4803	5173
0.4	5542	5910	6276	6640	7003	7364	7724	8082	8439	8793
0.5	0.6 9146	9497	9847	*0194	*0540	*0884	*1226	*1566	*1904	*2240

4.1	9998	9998	9998	9998	9998	9998	9998	9998	9999	9999
4.2	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999
4.3	9999	9999	9999	9999	9999	9999	9999	9999	9999	9999
4.4	0.9 9999	9999	*0000	*0000	*0000	*0000	*0000	*0000	*0000	*0000
4.5	1.0 0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
X	0	1	2	3	4	5	6	7	8	9

## NORMAL FREQUENCY DISTRIBUTION

## 2.1.51502

Column headings are: X, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9; values of X range from 0.00 through 5.09 at intervals of 0.01; the most significant part of X is a row heading while the least significant part of X is a column heading; entries are tabulated to five decimal places and represent the normal frequency distribution from  $-\infty$  to X; 7 pages.

$$\text{Normal Frequency Distribution: } Y = \frac{1}{\sqrt{2\pi}} e^{-x^2/2}$$

X	0	1	2	3	4	5	6	7	8	9
0.0	0.39894	9892	9886	9876	9862	9844	9822	9797	9767	9733
0.1	9695	9654	9608	9559	9505	9448	9387	9322	9253	9181
0.2	9104	9024	8940	8853	8762	8667	8568	8466	8361	8251
0.3	8139	8023	7903	7780	7654	7524	7391	7255	7115	6973
0.4	6827	6678	6526	6371	6213	6053	5889	5723	5553	5381
0.5	5207	5029	4849	4667	4482	4294	4105	3912	3718	3521

4.4	0002	0002	0002	0002	0002	0002	0002	0002	0002	0002
4.5	0002	0002	0001	0001	0001	0001	0001	0001	0001	0001
4.6	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
4.7	0001	0001	0001	0001	0001	0001	0000	0000	0000	0000
4.8	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
4.9	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000
5.0	0.00000	0000	0000	0000	0000	0000	0000	0000	0000	0000
X	0	1	2	3	4	5	6	7	8	9

## CUMULATIVE NORMAL PROBABILITIES

## 2.1.71551

Column headings are: z, F(z); values of z range from .00 through 2.60 at intervals of .01, from 2.60 through 3.00 at intervals of .10, from 3.00 through 4.00 at intervals of .20, and 4.00 through 5.50 at intervals of .50; F(z) represents the cumulative probability in the intervals  $-\infty$  to z; entries are tabulated to seven decimal places; 6 pages.

z	F(z)	z	F(z)	z	F(z)	z	F(z)
.00	.5000000	.21	.5831662	.42	.6627573	.63	.7356527
.01	.5039894	.22	.5870604	.43	.6664022	.64	.7389137
.02	.5079783	.23	.5909541	.44	.6700314	.65	.7421539
.03	.5119665	.24	.5948349	.45	.6736448	.66	.7453731
.04	.5159534	.25	.5987063	.46	.6772419	.67	.7485711
1.20	.8849303	1.68	.9535213	2.15	.9842224	2.80	.9974449
1.21	.8868606	1.69	.9544860	2.16	.9846137	2.90	.9981342
1.22	.8887676	1.70	.9554345	2.17	.9850966	3.00	.9986501
1.23	.8906514	1.71	.9563671	2.18	.9853713	3.20	.9993129
1.24	.8925123	1.72	.9572838	2.19	.9857379	3.40	.9996631
1.25	.8943502	1.73	.9581849	2.20	.9860966	3.60	.9998409
1.26	.8961653	1.74	.9590705	2.21	.9864474	3.80	.9999277
1.27	.8979577	1.75	.9599408	2.22	.9867906	4.00	.9999683
1.28	.8997274	1.76	.9607961	2.23	.9871263	4.50	.9999966
1.29	.9014747	1.77	.9616364	2.24	.9874545	5.00	.9999997
1.30	.9031995	1.78	.9624620	2.25	.9877755	5.50	.9999999
1.31	.9049021						

This table is condensed from Table 1 of the *Biometrika Tables for Statisticians*, Vol. 1 (ed. 1), edited by E. S. Pearson and H. O. Hartley. Reproduced here with the kind permission of E. S. Pearson and the trustees of *Biometrika*.

**BINOMIAL DISTRIBUTION:****BINOMIAL PROBABILITY**

2.2.131305

This table has three parameters:

- (1) n: n represents the number of trials and has values of 5, 10, 15, 20, and 25; these are covered in five blocks of figures;
- (2) a: a represents the number of successes in ranges 0 through n (row headings)
- (3) p: p represents the probability of success in one trial and has values 0.01, 0.05, 0.10, 0.20, 0.30, 0.40, 0.50, 0.60, 0.70, 0.80, 0.90, 0.95, 0.99; these represent column headings; entries are tabulated to three decimal places; 21 pages.

Tabulated values are  $\sum_{y=0}^n p(y)$ .

(a)  $n = 5$ 

<i>P</i>														
	0.01	0.05	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.99	
0	.951	.774	.590	.328	.168	.078	.031	.010	.002	.000	.000	.000	.000	
1	.999	.977	.919	.737	.528	.337	.188	.087	.031	.007	.000	.000	.000	
2	1.000	.999	.991	.942	.837	.683	.500	.317	.163	.058	.009	.001	.000	
3	1.000	1.000	1.000	.993	.969	.913	.812	.663	.472	.263	.081	.023	.001	
4	1.000	1.000	1.000	1.000	.998	.990	.969	.922	.832	.672	.410	.226	.049	

(b)  $n = 10$ 

<i>P</i>														
	0.01	0.05	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.99	
0	.904	.599	.349	.107	.028	.006	.001	.000	.000	.000	.000	.000	.000	
1	.996	.914	.736	.376	.149	.046	.011	.002	.000	.000	.000	.000	.000	
2	1.000	.988	.930	.678	.383	.167	.055	.012	.002	.000	.000	.000	.000	
7	1.000	1.000	1.000	1.000	.998	.988	.945	.833	.617	.322	.070	.012	.000	
8	1.000	1.000	1.000	1.000	1.000	.998	.989	.954	.851	.624	.264	.086	.004	
9	1.000	1.000	1.000	1.000	1.000	1.000	.999	.994	.972	.893	.651	.401	.096	

(c)  $n = 25$ 

<i>P</i>														
	0.01	0.05	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	0.95	0.99	
0	.778	.277	.072	.004	.000	.000	.000	.000	.000	.000	.000	.000	.000	
1	.974	.642	.271	.027	.002	.000	.000	.000	.000	.000	.000	.000	.000	
2	.998	.873	.537	.048	.009	.000	.000	.000	.000	.000	.000	.000	.000	
21	1.000	1.000	1.000	1.000	1.000	1.000	1.000	.998	.967	.766	.236	.034	.000	
22	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	.991	.902	.463	.127	.002	
23	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	.998	.973	.729	.358	.026	
24	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	.996	.928	.723	.222	

## INDIVIDUAL TERMS, BINOMIAL DISTRIBUTION

2.2.131324

This table contains three parameters:

- (a) n: n represents the number of trials and has values 2 through 25;
  - (b) x: x represents the number of successes and ranges from 0 through n;
  - (c) p: p represents the probability of success in one trial and has the values: .01, .05, .10 through .90 at intervals of .10, and .95 and .99 (column headings);
- entries are tabulated to three decimal places but the decimal point is omitted; 65 pages.

$$\binom{n}{x} p^x q^{n-x}$$

<i>n</i>	<i>x</i>	.01	.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95	.99	<i>p</i>	<i>x</i>
2	0	980	902	810	640	490	360	250	160	900	040	010	002	0+	0	0
	1	020	095	180	320	420	480	500	480	420	320	180	095	020		
	2	0+	002	010	040	090	160	250	360	490	640	810	902	980		
3	0	970	857	729	512	343	216	125	064	027	008	001	0+	0+	0	0
	1	029	135	243	384	441	432	375	288	189	096	027	007	0+		
	2	0+	007	027	096	189	288	375	432	441	384	243	135	029		
4	0	0+	0+	001	008	027	064	125	216	343	512	729	857	970	3	3
	1	904	599	349	107	028	006	001	0+	0+	0+	0+	0+	0+		
	2	091	315	387	268	121	040	010	002	0+	0+	0+	0+	0+		
10	3	004	075	194	302	233	121	044	011	001	0+	0+	0+	0+	2	2
	4	0+	010	057	201	267	215	117	042	009	001	0+	0+	0+		
	5	0+	001	011	088	200	251	205	111	037	006	0+	0+	0+		
	6	0+	0+	0+	006	037	111	205	251	200	088	011	001	0+		
	7	0+	0+	0+	001	009	042	117	215	267	201	057	010	0+		
	8	0+	0+	0+	0+	001	011	044	121	233	302	194	075	004		
	9	0+	0+	0+	0+	0+	002	010	040	121	268	387	315	091		
	10	0+	0+	0+	0+	0+	0+	001	006	028	107	349	599	904		
	11	0+	0+	0+	0+	0+	0+	0+	0+	0+	0+	0+	0+	0+		
	12	0+	0+	0+	0+	0+	0+	0+	0+	0+	0+	0+	0+	0+		
25	0	778	277	072	004	0+	0+	0+	0+	0+	0+	0+	0+	0+	0	0
	1	196	365	199	024	001	0+	0+	0+	0+	0+	0+	0+	0+		
	2	024	231	266	071	007	0+	0+	0+	0+	0+	0+	0+	0+		
	3	002	093	226	136	024	002	0+	0+	0+	0+	0+	0+	0+		
	4	0+	027	138	187	057	007	0+	0+	0+	0+	0+	0+	0+		
21	0	0+	0+	0+	0+	0+	0+	007	037	187	138	027	0+	21	21	
	1	0+	0+	0+	0+	0+	0+	002	024	138	228	093	002			
	2	0+	0+	0+	0+	0+	0+	0+	007	071	268	231	024			
	3	0+	0+	0+	0+	0+	0+	0+	001	024	199	365	196			
	4	0+	0+	0+	0+	0+	0+	0+	0+	0+	0+	0+	0+			
22	0	0+	0+	0+	0+	0+	0+	0+	004	072	277	778	23	22	22	
	1	0+	0+	0+	0+	0+	0+	0+	002	024	138	228	093	002		
	2	0+	0+	0+	0+	0+	0+	0+	007	071	268	231	024			
	3	0+	0+	0+	0+	0+	0+	0+	001	024	199	365	196			
	4	0+	0+	0+	0+	0+	0+	0+	0+	0+	0+	0+	0+			
23	0	0+	0+	0+	0+	0+	0+	0+	0+	0+	0+	0+	0+	0+	23	23
	1	0+	0+	0+	0+	0+	0+	0+	002	024	138	228	093	002		
	2	0+	0+	0+	0+	0+	0+	0+	007	071	268	231	024			
	3	0+	0+	0+	0+	0+	0+	0+	001	024	199	365	196			
	4	0+	0+	0+	0+	0+	0+	0+	0+	0+	0+	0+	0+			

## BINOMIAL PROBABILITIES

2.2.140721

This table contains three parameters:

- (a)  $n$ :  $n$  represents the number of trials and has values 5 through 25, and 30, and 100;
- (b)  $x$ :  $x$  represents the number of successes and ranges from 0 through  $n$ , except that when  $n = 50$ ,  $x$  ranges from 0 through 39, and when  $n = 100$ ,  $x$  ranges from 0 through 70 (row headings);
- (c)  $p$ :  $p$  represents the probability of success in one trial and has the values: .10, .20, .25, .30,  $1/3$ , .40, .50 for values of  $n$  from 5 through 25; when  $n = 50$  or  $n = 100$ , the values of  $p$  are: .10,  $1/3$ , and  $1/2$ ; entries are tabulated to four decimal places, but the decimal point is omitted in the braille version; a formula for  $B(x; n, p)$  is given with a short description of its use; 35 pages.

$$B(x; n, p) = C(n, x)p^x q^{n-x}$$

$x$	$p = .10$	$p = .20$	$p = .25$	$p = .30$	$p = .30$	$p = 1/3$	$p = .40$	$p = .50$	$n$
$n = 5$	0	0.5905	0.3277	0.2373	0.1681	0.1317	0.0778	0.0313	5
	1	0.3280	0.4096	0.3955	0.3601	0.3292	0.2592	0.1563	4
	2	0.0729	0.2048	0.2637	0.3087	0.3292	0.3446	0.3125	3
	3	0.0081	0.0512	0.0879	0.1323	0.1646	0.2304	0.3125	2
	4	0.0004	0.0064	0.0146	0.0263	0.0412	0.0768	0.1563	1
	5	0.0000	0.0003	0.0010	0.0024	0.0011	0.0107	0.0313	0

$n$	$x$	$B(x; 50, .1)$
$n = 50$	0	0.0052
	1	0.0286
	2	0.0779
	3	0.1386
	4	0.1809
	5	0.1849
$n = 50$	6	0.1541
	7	0.1076
	8	0.0643
	9	0.0333
	10	0.0152
	11	0.0061
$n = 50$	12	0.0022
	13	0.0007
	14	0.0002
	15	0.0001
	16	0.0000
	17	0.1178
$n = 50$	18	0.1080
	19	0.0910
	20	0.0270
	21	0.0160
	22	0.0087
	23	0.0044
$n = 50$	24	0.0020
	25	0.0008
	26	0.0003
	27	0.0001
	28	0.0000
	29	0.0002
$n = 50$	30	0.0598
	31	0.0419
	32	0.0270
	33	0.0160
	34	0.0087
	35	0.0044
$n = 50$	36	0.0020
	37	0.0008
	38	0.0003
	39	0.0001
	40	0.0000

$n$	$x$	$B(x; 100, .1)$
$n = 100$	0	0.0000
	1	0.0003
	2	0.0016
	3	0.0059
	4	0.0199
	5	0.0313
$n = 100$	6	0.0412
	7	0.0485
	8	0.0513
	9	0.0513
	10	0.0327
	11	0.0192
$n = 100$	12	0.0066
	13	0.0022
	14	0.0007
	15	0.0000
	16	0.0000
	17	0.0000
$n = 100$	18	0.0000
	19	0.0000
	20	0.0000
	21	0.0000
	22	0.0000
	23	0.0000
$n = 100$	24	0.0000
	25	0.0000
	26	0.0000
	27	0.0000
	28	0.0000
	29	0.0000
$n = 100$	30	0.0000
	31	0.0000
	32	0.0000
	33	0.0000
	34	0.0000
	35	0.0000
$n = 100$	36	0.0000
	37	0.0000
	38	0.0000
	39	0.0000
	40	0.0000
	41	0.0000
$n = 100$	42	0.0000
	43	0.0000
	44	0.0000
	45	0.0000
	46	0.0000
	47	0.0000
$n = 100$	48	0.0000
	49	0.0000
	50	0.0000
	51	0.0000
	52	0.0000
	53	0.0000
$n = 100$	54	0.0000
	55	0.0000
	56	0.0000
	57	0.0000
	58	0.0000
	59	0.0000
$n = 100$	60	0.0000
	61	0.0000
	62	0.0000
	63	0.0000
	64	0.0000
	65	0.0000
$n = 100$	66	0.0000
	67	0.0000
	68	0.0000
	69	0.0000
	70	0.0000

## BINOMIAL PROBABILITIES

2.2.141020

This table contains three parameters:

- (a)  $n$ :  $n$  represents the number of trials and has values 1 through 20;
  - (b)  $k_i$ :  $k_i$  represents the number of successes and ranges from 0 through  $n$ ;
  - (c)  $p$ :  $p$  represents the probability of success in one trial and has the values .05, .10, .15, .20, .25, .30, .35, .40, .45, and .50; entries represent the probability of at least  $k_i$  successes; entries are tabulated to four decimals; 42 pages.

## CUMULATIVE TERMS, BINOMIAL DISTRIBUTION

2.2.231324

This table contains three parameters:

- (a) n: n represents the number of trials and has values 2 through 25;  
 (b) r: r represents the number of successes and ranges from 0 through n;  
 (c) p: p represents the probability of success in one trial and has the values: .01, .05, .10 through .90 at intervals of .10; .95 and .99; entries represent the probability of at least r successes; the entries which are listed to three decimal places have the decimal omitted; 65 pages.

n	r	.01	.05	.10	.20	.30	.40	<i>p</i>							r
		.50	.60	.70	.80	.90	.95	.99							
2	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0
	1	020	098	190	360	510	640	750	840	910	960	990	998	1-	1
	2	0+	002	010	040	090	160	250	360	490	640	810	902	980	2
3	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0
	1	030	143	271	488	657	784	875	936	973	992	999	1-	1-	1
	2	0+	007	028	104	216	352	500	648	784	896	972	993	1-	2
	3	0+	0+	001	008	027	064	125	216	343	512	729	857	970	3
4	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0
	1	039	185	344	590	760	870	938	974	992	998	1-	1-	1-	1
	2	001	014	052	181	348	525	688	821	916	973	996	1-	1-	2
	3	0+	0+	004	027	084	179	312	475	652	819	948	986	999	3
	4	0+	0+	0+	002	008	026	062	130	240	410	656	815	961	4

25	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0
1	222	723	928	996	1-	1-	1-	1-	1-	1-	1-	1-	1-	1-	1
2	026	358	729	973	998	1-	1-	1-	1-	1-	1-	1-	1-	1-	2
3	002	127	463	902	991	1-	1-	1-	1-	1-	1-	1-	1-	1-	3
4	0+	034	236	766	967	998	1-	1-	1-	1-	1-	1-	1-	1-	4
5	0+	007	098	579	910	991	1-	1-	1-	1-	1-	1-	1-	1-	5
6	0+	001	033	383	807	971	998	1-	1-	1-	1-	1-	1-	1-	6

20	0+	0+	0+	0+	0+	0+	002	029	193	617	967	999	1-	20
21	0+	0+	0+	0+	0+	0+	0+	009	090	421	902	993	1-	21
22	0+	0+	0+	0+	0+	0+	0+	002	033	234	764	966	1-	22
23	0+	0+	0+	0+	0+	0+	0+	0+	009	098	537	873	998	23
24	0+	0+	0+	0+	0+	0+	0+	0+	002	027	271	642	974	24
25	0+	0+	0+	0+	0+	0+	0+	0+	004	072	277	778	999	25

TABLE OF PROBABILITIES ASSOCIATED WITH VALUES AS SMALL AS  
OBSERVED VALUES OF X IN THE BINOMIAL TEST

2.2.431621

The row variable N is in the range from 5 through 25 at intervals of 1; the column variable X is in the range from 0 through 15 at intervals of 1; probabilities are listed to three decimal places, but the decimal points are omitted; 3 pages.

Given in the body of this table are one-tailed probabilities under  $H_0$  for the binomial test when  $P = Q = \frac{1}{2}$ . To save space, decimal points are omitted in the p's.

$N$	$x$	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
5		031	188	500	812	969	†										
6		016	109	344	656	891	984	†									
7		008	062	227	500	773	938	992	†								
8		004	035	145	363	637	855	965	996	†							
9		002	020	090	254	500	746	910	980	998	†						
10		001	011	055	172	377	623	828	945	989	999	†					
11		006	033	113	274	500	726	887	967	994	†	†					
12		003	019	073	194	387	613	806	927	981	997	†	†				
13		002	011	046	133	291	500	709	867	954	989	998	†	†			
14		001	006	029	090	212	395	605	788	910	971	994	999	†	†		
15		004	018	059	151	304	500	696	849	941	982	996	†	†	†		
16		002	011	038	105	227	402	598	773	895	962	989	998	†	†		
17		001	006	025	072	166	315	500	685	834	928	975	994	999	†		
18		001	004	015	048	119	240	407	593	760	881	952	985	996	999		
23		001	005	017	047	105	202	339	500	661	798	895	953				
24		001	003	011	032	076	154	271	419	581	729	846	924				
25		002	007	022	054	115	212	345	500	655	788	885					

† 1.0 or approximately 1.0.

## POISSON DISTRIBUTION

## 2.3.3150

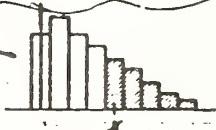
Column headings are:  $m$ ,  $x$ ; under  $x$  are subheadings from 0 through 14 at intervals of 1; under  $m$ , row headings are from .10 through 2.0 at intervals of .1, and from 2.0 through 5.0 at intervals of .2; entries are listed to three decimals; 8 pages.

	$x = 0$	$x = 1$	$x = 2$	$x = 3$	$x = 4$	$x = 5$	$x = 6$	$x = 7$	$x = 8$	$x = 9$	$x = 10$	$x = 11$	$x = 12$	$x = 13$	$x = 14$
.10	1.000	.095	.005												
.20	1.000	.181	.018	.001											
.30	1.000	.259	.037	.004											
.40	1.000	.330	.062	.008	.001										
.50	1.000	.393	.090	.014	.002										
.60	1.000	.451	.122	.023	.003										
.70	1.000	.503	.156	.034	.006	.001									
.80	1.000	.551	.191	.042	.009	.001									
.90	1.000	.593	.228	.063	.013	.002									
1.00	1.000	.632	.264	.080	.010	.004	.001								

TABLE II

## Poisson Distribution

Each number in this table represents the probability of obtaining at least  $X$  successes, or the area under the histogram to the right of and including the rectangle whose center is at  $X$ .



1.6	1.000	.798	.475	.217	.079	.024	.006	.001							
1.7	1.000	.817	.507	.243	.093	.030	.008	.002							
1.8	1.000	.835	.537	.269	.109	.036	.010	.003	.001						
1.9	1.000	.850	.566	.296	.125	.044	.013	.003	.001						
2.0	1.000	.865	.594	.323	.143	.053	.017	.005	.001						
2.2	1.000	.889	.645	.377	.181	.072	.025	.007	.002						
4.2	1.000	.985	.922	.790	.605	.410	.247	.133	.064	.028	.011	.004	.001		
4.4	1.000	.988	.934	.815	.641	.449	.280	.156	.079	.036	.015	.006	.002	.001	
4.6	1.000	.990	.944	.837	.674	.487	.314	.182	.095	.045	.020	.008	.003	.001	
4.8	1.000	.992	.952	.857	.706	.524	.349	.209	.113	.056	.025	.010	.004	.001	
5.0	1.000	.993	.960	.875	.735	.560	.384	.238	.133	.068	.032	.014	.005	.002	.001

## POISSON DISTRIBUTION

## 2.3.3162

Column headings are:  $[t]$ ,  $\mu$ ; under  $\mu$ , subheadings are: .50, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0, 12.0, 13.0, 14.0, 15.0; row headings under  $[t]$  are from 0 through 29 at intervals of 1; entries are tabulated to three decimal places; an explanatory note precedes the table; 6 pages.

$[t]$	$\mu$									$[t]$	$\mu$					
	.50	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0		10.0	11.0	12.0	13.0	14.0	15.0
0	.607	.368	.135	.050	.018					2	.003	.001	.001	.000	.000	.000
1	.910	.736	.406	.199	.092					3	.010	.005	.002	.001	.000	.000
2	.986	.920	.677	.423	.238					4	.029	.015	.008	.004	.002	.001
3	.998	.981	.857	.647	.433					5	.067	.038	.020	.011	.006	.003
4	1.000	.996	.947	.815	.629					6	.130	.079	.046	.026	.014	.008
										7	.220	.143	.090	.054	.032	.018

$$F(t) = \sum_{x=0}^{[t]} \frac{\mu^x}{x!} e^{-\mu}$$

25	1.000	1.000	1.000	.999	.997	.994
26	1.000	1.000	1.000	1.000	.999	.997
27	1.000	1.000	1.000	1.000	.999	.998
28	1.000	1.000	1.000	1.000	1.000	.999
29	1.000	1.000	1.000	1.000	1.000	1.000

## POISSON PROBABILITIES

## 2.3.4281

Values of  $x$  (row headings) range from 0 through 25 at intervals of 1; values of  $\lambda$  (column headings) range from 0.1 through 2.0 at intervals of .1, and from 2.0 through 10.0 at intervals of 1.0; entries are tabulated to four decimal places; an explanatory note precedes the table; 7 pages.

$x \setminus \lambda$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0	0.9048	0.8187	0.7408	0.6703	0.6065	0.5488	0.4966	0.4493	0.4066	0.3679
1	0.0905	0.1637	0.2222	0.2681	0.3033	0.3293	0.3476	0.3595	0.3659	0.3679
2	0.0045	0.0164	0.0333	0.0536	0.0758	0.0988	0.1217	0.1438	0.1647	0.1839
3	0.0002	0.0011	0.0033	0.0072	0.0126	0.0198	0.0284	0.0383	0.0494	0.0613
4	0.0000	0.0001	0.0003	0.0007	0.0016	0.0030	0.0050	0.0077	0.0111	0.0153
5	0.0000	0.0000	0.0000	0.0001	0.0002	0.0004	0.0007	0.0012	0.0020	0.0031
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0003	0.0005
7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001

$x \setminus \lambda$	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
0	0.3329	0.3012	0.2725	0.2466	0.2231	0.2019	0.1827	0.1653	0.1496	0.1353
1	0.3662	0.3614	0.3543	0.3452	0.3347	0.3230	0.3106	0.2975	0.2847	0.2707
2	0.2014	0.2169	0.2303	0.2417	0.2510	0.2584	0.2640	0.2678	0.2700	0.2707
3	0.0738	0.0867	0.0998	0.1128	0.1255	0.1378	0.1496	0.1607	0.1710	0.1804
4	0.0203	0.0260	0.0324	0.0395	0.0471	0.0551	0.0636	0.0723	0.0812	0.0902
5	0.0045	0.0062	0.0084	0.0111	0.0141	0.0176	0.0216	0.0260	0.0309	0.0361
6	0.0008	0.0012	0.0018	0.0026	0.0035	0.0047	0.0061	0.0078	0.0098	0.0120
7	0.0001	0.0002	0.0003	0.0005	0.0008	0.0011	0.0015	0.0020	0.0027	0.0034
8	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002	0.0003	0.0005	0.0006	0.0009
9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002

$x \setminus \lambda$	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
0	0.0498	0.0183	0.0067	0.0025	0.0009	0.0003	0.0001	0.0000
1	0.1494	0.0733	0.0337	0.0149	0.0064	0.0027	0.0011	0.0005
2	0.2240	0.1465	0.0842	0.0446	0.0223	0.0107	0.0050	0.0023
3	0.2240	0.1954	0.1404	0.0892	0.0521	0.0286	0.0150	0.0076
4	0.1680	0.1954	0.1755	0.1339	0.0912	0.0573	0.0337	0.0189
5	0.1008	0.1563	0.1755	0.1606	0.1277	0.0916	0.0607	0.0378
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002	0.0006	0.0019
21	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0003	0.0009
22	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0004
23	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0002
24	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
25								0

## POISSON PROBABILITIES

## 2.3.4501

Column headings are:  $x$ ,  $\lambda$ ; row headings under  $x$  are 0 through 15 at intervals of 1; subheadings under  $\lambda$  are 0.1 through 5.0 at intervals of .1; entries are to four decimal places; 10 pages.

## t DISTRIBUTION

### CRITICAL VALUES OF t

#### 2.4.20552

Degrees of freedom are listed from 1 through 30 at intervals of 1, from 30 through 50 at intervals of 5, from 50 through 100 at intervals of 10, from 100 through 150 at intervals of 25, as well as 200, 300, 400, 500, 1000, and  $\infty$ ; levels of significance for a two-tailed test are: 0.50, 0.10, 0.05, 0.02, 0.01 and serve as column headings; for the most part entries are tabulated to three significant figures; 3 pages.

Degrees of Freedom	Probability				
	0.50	0.10	0.05	0.02	0.01
1	1.000	6.39	12.71	31.82	63.66
2	0.816	2.92	4.30	6.96	9.92
3	.765	2.35	3.18	4.54	5.84
4	.741	2.13	2.78	3.75	4.60
5	.727	2.02	2.57	3.36	4.03
6	.718	1.94	2.45	3.14	3.71
7	.711	1.90	2.36	3.00	3.50
90	.677	1.66	1.99	2.37	2.63
100	.677	1.66	1.98	2.36	2.63
125	.676	1.66	1.98	2.36	2.62
150	.676	1.66	1.98	2.35	2.61
200	.675	1.65	1.97	2.35	2.60
300	.675	1.65	1.97	2.34	2.59
400	.675	1.65	1.97	2.34	2.59
500	.674	1.65	1.96	2.33	2.59
1000	.674	1.65	1.96	2.33	2.58
$\infty$	.674	1.64	1.96	2.33	2.58

Source: Reproduced by permission from C. H. Goulden, *Methods of Statistical Analysis* (New York: John Wiley & Sons, 1939).

### PERCENTILES FOR THE t-DISTRIBUTION

#### 2.4.20621

Row headings under  $n$  range from 1 through 50 at intervals of 1; levels of significance for a one-tailed test are: .8, .9, .95, .975, .99, and .995; entries are tabulated in the form n.xx; 4 pages.

$n$	.8	.9	.95	.975	.99	.995
1	1.38	3.08	6.31	12.71	31.82	63.66
2	1.06	1.89	2.92	4.30	6.96	9.92
3	0.98	1.64	2.35	3.18	4.54	5.84
4	0.94	1.53	2.13	2.78	3.75	4.60
5	0.92	1.48	2.01	2.57	3.36	4.03
6	0.91	1.44	1.94	2.45	3.14	3.71
45	0.85	1.30	1.68	2.01	2.41	2.69
46	0.85	1.30	1.68	2.01	2.41	2.69
47	0.85	1.30	1.68	2.01	2.41	2.68
48	0.85	1.30	1.68	2.01	2.41	2.68
49	0.85	1.30	1.68	2.01	2.40	2.68
50	0.85	1.30	1.68	2.01	2.40	2.68

## t DISTRIBUTION:

## 2.4.20841

Values of  $n$  (row headings) range from 1 through 30 at intervals of 1, as well as 40, 60, 120, and  $\infty$ ; levels of significance for a one-tailed test (column headings) are: .75, .80, .90, .95, .975, .99, .995, .9995; the corresponding column footings are: -.25, -.20, -.10, -.05, -.025, -.01, -.005, and -.0005; entries are tabulated to two decimal places; 6 pages.

$n$	$t_{.75}$	$t_{.80}$	$t_{.90}$	$t_{.95}$	$t_{.975}$	$t_{.99}$	$t_{.995}$	$t_{.9995}$	$n$
1	1.00	1.38	3.08	6.31	12.71	31.82	63.66	636.62	1
2	.82	1.06	1.89	2.92	4.30	6.96	9.92	31.60	2
3	.76	.98	1.64	2.35	3.18	4.54	5.84	12.94	3
4	.74	.94	1.53	2.13	2.78	3.75	4.60	8.61	4
5	.73	.92	1.48	2.02	2.57	3.36	4.03	6.86	5
6	.72	.91	1.44	1.94	2.45	3.14	3.71	5.95	6
29	.68	.85	1.31	1.70	2.04	2.46	2.76	3.66	29
30	.68	.85	1.31	1.70	2.04	2.46	2.75	3.65	30
40	.68	.85	1.30	1.68	2.02	2.42	2.70	3.55	40
60	.68	.85	1.30	1.67	2.00	2.39	2.66	3.46	60
120	.68	.85	1.29	1.66	1.98	2.36	2.62	3.37	120
$\infty$	.6745	.842	1.282	1.645	1.960	2.326	2.576	3.291	$\infty$
	$-t_{.75}$	$-t_{.80}$	$-t_{.90}$	$-t_{.95}$	$-t_{.975}$	$-t_{.99}$	$-t_{.995}$	$-t_{.9995}$	

\* Reprinted abridged from R. A. Fisher and F. Yates, Statistical Tables, published by Oliver and Boyd Ltd. by permission of the auth and publishers.

## STUDENT'S t DISTRIBUTION:

## 2.4.30212

Degrees of freedom are listed from 1 through 30 at intervals of 1; levels of significance for a two-tailed test are: .05 and .01; values are tabulated to three decimal places; 1 page.

Degrees of Freedom	.05 5 Per Cent	.01 1 Per Cent	Degrees of Freedom	.05 5 Per Cent	.01 1 Per Cent
1	12.706	63.657	16	2.120	2.921
2	4.303	9.925	17	2.110	2.898
3	3.182	5.841	18	2.101	2.878
4	2.776	4.604	19	2.093	2.861
5	2.571	4.032	20	2.086	2.845

11	2.201	3.106	26	2.056	2.779
12	2.179	3.055	27	2.052	2.771
13	2.160	3.012	28	2.048	2.763
14	2.145	2.977	29	2.045	2.756
15	2.131	2.947	30	2.042	2.750

Table C is reprinted abridged from Table IV of R. A. Fisher: *Statistical Methods for Research Workers*, published by Oliver & Boyd, Ltd., Edinburgh, by permission of the author and publishers.

## VALUES OF t AT THE 5% AND 1% LEVELS OF SIGNIFICANCE

### 2.4.30242

Degrees of freedom range from 1 through 30 at intervals of 1, from 30 through 50 at intervals of 5, from 50 through 100 at intervals of 10, and infinity; column headings are 5% and 1%; entries are tabulated to three decimals; 2 pages.

DEGREES OF FREEDOM (df)	5%	1%
1	12.706	63.657
2	4.303	9.925
3	3.182	5.841
4	2.776	4.604
5	2.571	4.032
<hr/>		
35	2.030	2.724
40	2.021	2.704
45	2.014	2.690
50	2.008	2.678
60	2.000	2.660
70	1.994	2.648
80	1.990	2.638
90	1.987	2.632
100	1.984	2.626
=	1.960	2.576

### t VALUES

### 2.4.30252

Column headings: df,  $\alpha$ ;  $\alpha$  has subheadings .01, .05; row headings under df are listed from 6 through 40 at intervals of 1, from 40 through 60 at intervals of 2, from 60 through 80 at intervals of 4, from 80 through 100 at intervals of 10, then 120, 150, 200, 300, 400, 600, 1000,  $\infty$ ; entries are tabulated to three decimal places; 2 pages.

t Values for  $\alpha = .01, .05$  (Two Tailed)<sup>a</sup>

$\alpha$	df		$\alpha$	df		
	df	.01		df	.01	
	6	3.707	2.447	36	2.720	2.028
	7	3.499	2.365	37	2.715	2.026
	8	3.355	2.306	38	2.712	2.024
	9	3.250	2.262	39	2.708	2.023
	10	3.169	2.228	40	2.704	2.021
<hr/>						
	21	2.831	2.080	64	2.655	1.998
	22	2.819	2.074	68	2.650	1.996
	23	2.807	2.069	72	2.646	1.994
	24	2.797	2.064	76	2.642	1.992
	25	2.787	2.060	80	2.639	1.990
<hr/>						
	31	2.744	2.040	300	2.592	1.968
	32	2.738	2.037	400	2.588	1.966
	33	2.733	2.034	600	2.584	1.964
	34	2.728	2.032	1000	2.581	1.962
	35	2.724	2.030	$\infty$	2.576	1.960

<sup>a</sup>This table is abridged from Table 2.1 in Owen (1962). Reproduced with the permission of the publishers, (Courtesy of the U.S. Atomic Energy Commission.)

## t DISTRIBUTION

## 2.4.30501

Degrees of freedom are listed from 1 through 29 at intervals of 1, as well as infinity; levels of significance for a one-tailed test are: .100, .050, .025, .010, .005; entries are tabulated to three decimal places; 2 pages.

d.f.	t <sub>.100</sub>	t <sub>.050</sub>	t <sub>.025</sub>	t <sub>.010</sub>	t <sub>.005</sub>	d.f.
1	3.078	6.314	12.706	31.821	63.657	1
2	1.886	2.920	4.303	6.965	9.925	2
3	1.638	2.353	3.182	4.541	5.841	3
4	1.533	2.132	2.776	3.747	4.604	4
5	1.476	2.015	2.571	3.365	4.032	5
26	1.315	1.706	2.056	2.479	2.779	26
27	1.314	1.703	2.052	2.473	2.771	27
28	1.313	1.701	2.048	2.467	2.763	28
29	1.311	1.699	2.045	2.462	2.756	29
inf.	1.282	1.645	1.960	2.326	2.576	inf.

This table is abridged from Table IV of R. A. Fisher, *Statistical Methods for Research Workers*, published by Oliver and Boyd Ltd., Edinburgh, by permission of the author and publishers.

## STUDENT'S t DISTRIBUTION

## 2.4.30611

Degrees of freedom are listed from 1 through 29 and Z; subheadings under  $\alpha$  in one-tail are: 0.25, 0.10, 0.05, 0.025, 0.01, 0.005; entries under 0.25 are tabulated to three decimals, and under the remaining columns to two decimal places; 2 pages.

df	Amount of $\alpha$ in one-tail					
	0.25	0.10	0.05	0.025	0.01	0.005
1	1.000	3.08	6.31	12.7	31.8	63.7
2	0.816	1.89	2.92	4.30	6.97	9.92
3	0.765	1.64	2.35	3.18	4.54	5.84
4	0.741	1.53	2.13	2.78	3.75	4.60
5	0.727	1.48	2.02	2.57	3.37	4.03
25	0.684	1.32	1.71	2.06	2.49	2.79
26	0.684	1.32	1.71	2.06	2.48	2.78
27	0.684	1.31	1.70	2.05	2.47	2.77
28	0.683	1.31	1.70	2.05	2.47	2.76
29	0.683	1.31	1.70	2.05	2.46	2.76
Z	0.674	1.28	1.65	1.96	2.33	2.58

Adapted from E. S. Pearson and H. O. Hartley, *Biometrika Tables for Statisticians*, Vol. I (1966), p. 146. Reprinted by permission of the Biometrika Trustees.

## CRITICAL VALUES OF t

2.4.306432

Degrees of freedom are listed from 1 through 30 as well as 40, 60, 120,  $\infty$ ; levels of significance for a one-tailed test are: .10, .05, .025, .01, .005, .0005, while levels of significance for a two-tailed test are .20, .10, .05, .02, .01, .001; entries are tabulated to three decimal places; 3 pages.

df	Level of significance for one-tailed test					
	.10	.05	.025	.01	.005	.0005
	Level of significance for two-tailed test					
df	.20	.10	.05	.02	.01	.001
1	3.078	6.314	12.706	31.821	63.657	636.619
2	1.886	2.920	4.303	6.965	9.925	31.598
3	1.638	2.353	3.182	4.541	5.841	12.941
4	1.533	2.132	2.776	3.747	4.604	8.610
5	1.476	2.015	2.571	3.365	4.032	6.859
30	1.310	1.697	2.042	2.457	2.750	3.646
40	1.303	1.684	2.021	2.423	2.704	3.551
60	1.296	1.671	2.000	2.390	2.660	3.460
120	1.289	1.658	1.980	2.358	2.617	3.373
$\infty$	1.282	1.645	1.960	2.326	2.576	3.291

SOURCE: Table F is abridged from Table III of Fisher & Yates: *Statistical Tables for Biological, Agricultural, and Medical Research*, published by Oliver & Boyd Ltd., Edinburgh, and by permission of the authors and publishers.

## CRITICAL VALUES OF t

2.4.306435

Degrees of freedom range from 1 through 30 at intervals of 1, as well as 40, 60, 120,  $\infty$ ; levels of significance for a one-tailed test are: .25, .05, .025, .01, .005, .0005, while levels of significance for a two-tailed test are: .50, .10, .05, .02, .01, .001; entries are tabulated to three decimal places; 3 pages.

df	Alpha level of significance for directional (one-tailed) tests					
	.25	.05	.025	.01	.005	.0005
	Alpha level of significance for nondirectional (two-tailed) tests					
df	.50	.10	.05	.02	.01	.001
1	1.000	6.314	12.706	31.821	63.657	636.619
2	.816	2.920	4.303	6.965	9.925	31.598
3	.765	2.353	3.182	4.541	5.841	12.941
4	.741	2.132	2.776	3.747	4.604	8.610
5	.727	2.015	2.571	3.365	4.032	6.859
29	.683	1.699	2.045	2.462	2.756	3.659
30	.683	1.697	2.042	2.457	2.750	3.646
40	.681	1.684	2.021	2.423	2.704	3.551
60	.679	1.671	2.000	2.390	2.660	3.460
120	.677	1.658	1.980	2.358	2.617	3.373
$\infty$	.674	1.645	1.960	2.326	2.576	3.291

## STUDENT'S t DISTRIBUTION

## 2.4.30651

Degrees of freedom range from 1 through 40 at intervals of 1, from 40 through 60 at intervals of 5, from 60 through 100 at intervals of 10, then 120, 150, from 200 through 500 at intervals of 100, then 1000,  $\infty$ ; levels of significance for a one-tailed test are: .25, .10, .05, .025, .01, .005; entries are tabulated to three decimal places; 4 pages.

df	Area in one tail					
	.25	.10	.05	.025	.01	.005
1	1.000	3.078	6.314	12.706	31.821	63.657
2	0.816	1.886	2.920	4.303	6.965	9.925
3	0.765	1.638	2.353	3.182	4.541	5.841
4	0.741	1.533	2.132	2.776	3.747	4.604
5	0.727	1.476	2.015	2.571	3.365	4.032
40	0.681	1.303	1.684	2.021	2.423	2.704
45	0.680	1.301	1.679	2.014	2.412	2.690
50	0.679	1.299	1.676	2.009	2.403	2.678
55	0.679	1.297	1.673	2.004	2.396	2.668
60	0.679	1.296	1.671	2.000	2.390	2.660
70	0.678	1.294	1.667	1.994	2.381	2.648
150	0.676	1.287	1.655	1.976	2.352	2.609
200	0.676	1.286	1.652	1.972	2.345	2.601
300	0.675	1.284	1.650	1.968	2.339	2.592
400	0.675	1.284	1.649	1.966	2.336	2.588
500	0.675	1.283	1.648	1.965	2.334	2.586
1000	0.675	1.282	1.646	1.962	2.330	2.581
$\infty$	0.674	1.282	1.645	1.960	2.326	2.576

\*Modified from Section 2.1, *Handbook of Statistical Tables* by Donald B. Owen. Copyright © 1962, Addison-Wesley, Reading, Mass. Courtesy of U.S. Atomic Energy Commission.

## FRACTIONAL PARTS OF THE t DISTRIBUTION

## 2.4.30711

Row headings under f range from 1 through 30 at intervals of 1, then 40, 60, 120,  $\infty$ ; column headings are: 0.750, 0.900, 0.950, 0.975, 0.990, 0.995, 0.999; entries are tabulated to three decimal places; for a one-tailed test; 5 pages.

f \ P	0.750	0.900	0.950	0.975	0.990	0.995	0.999			
	1	2	3	4	5	30	40	60	120	$\infty$
1	1.000	3.078	6.314	12.706	31.821	63.657	318			
2	0.816	1.886	2.920	4.303	6.965	9.925	22.3			
3	0.765	1.638	2.353	3.182	4.541	5.841	10.2			
4	0.741	1.533	2.132	2.776	3.747	4.604	7.173			
5	0.727	1.476	2.015	2.571	3.365	4.032	5.893			
30	0.683	1.310	1.697	2.042	2.457	2.750	3.385			
40	0.681	1.303	1.684	2.021	2.423	2.704	3.307			
60	0.679	1.296	1.671	2.000	2.390	2.660	3.232			
120	0.677	1.289	1.658	1.980	2.358	2.617	3.160			
$\infty$	0.674	1.282	1.645	1.960	2.326	2.576	3.090			

\*Abridged from Table 12 of *Biometrika Tables for Statisticians*, vol. I, edited by E. S. Pearson and H. O. Hartley, Cambridge University Press, Cambridge (1954), and Table III of *Statistical Tables for Biological, Agricultural, and Medical Research*, R. A. Fisher and F. Yates, Oliver & Boyd, Edinburgh, 1953.

## t DISTRIBUTION:

## 2.4.30843

Degrees of freedom range from 1 through 30 at intervals of 1, as well as 40, 60, 120,  $\infty$ ; levels of significance for a one-tailed test are: 0.4, 0.25, 0.1, 0.05, 0.025, 0.01, 0.005, 0.001, while levels of significance for a two-tailed test are: 0.8, 0.5, 0.2, 0.1, 0.05, 0.02, 0.01, 0.002; entries are tabulated to three decimal places; 5 pages.

<i>df</i>	Q = .4 2Q = .8	.25 .5	.1 .2	.05 .1	.025 .05	.01 .02	.005 .01	.001 .002
1	0.325	1.000	3.078	6.314	12.706	31.821	63.657	318.31
2	.289	0.816	1.886	2.920	4.303	6.965	9.925	22.326
3	.277	.765	1.638	2.353	3.182	4.541	5.841	10.213
4	.271	.741	1.533	2.132	2.776	3.747	4.604	7.173
5	0.267	0.727	1.476	2.015	2.571	3.365	4.032	5.893
30	0.256	0.683	1.310	1.697	2.042	2.457	2.750	3.385
40	.255	.681	1.303	1.684	2.021	2.423	2.704	3.307
60	.254	.679	1.296	1.671	2.000	2.390	2.660	3.232
120	.254	.677	1.289	1.658	1.980	2.358	2.617	3.160
$\infty$	.253	.674	1.282	1.645	1.960	2.326	2.576	3.090

## PERCENTAGE POINTS OF THE t DISTRIBUTION

## 2.4.31043

Degrees of freedom range from 1 through 30 at intervals of 1, as well as 40, 60, 120,  $\infty$ ; levels of significance for a one-tailed test are: .4, .25, .1, .05, .025, .01, .005, .0025, .001, .0005, while levels of significance for a two-tailed test are: .8, .5, .2, .1, .05, .02, .01, .005, .002, .001; entries are tabulated to three decimal places; 5 pages.

<i>v</i>	Q = .4 2Q = .8	.25 .5	.1 .2	.05 .1	.025 .05	.01 .02	.005 .01	.0025 .005	.001 .002	.0005 .001
1	.325	1.000	3.078	6.314	12.706	31.821	63.657	127.32	318.31	636.62
2	.289	.816	1.886	2.920	4.303	6.965	9.925	14.089	22.327	31.598
3	.277	.765	1.638	2.353	3.182	4.541	5.841	7.453	10.214	12.924
4	.271	.741	1.533	2.132	2.776	3.747	4.604	5.598	7.173	8.610
5	0.267	0.727	1.476	2.015	2.571	3.365	4.032	4.773	5.893	6.869
29	0.256	0.683	1.311	1.699	2.045	2.462	2.756	3.038	3.396	3.659
30	0.256	0.683	1.310	1.697	2.042	2.457	2.750	3.030	3.385	3.646
40	.255	.681	1.303	1.684	2.021	2.423	2.704	2.971	3.307	3.551
60	.254	.679	1.296	1.671	2.000	2.390	2.660	2.915	3.232	3.460
120	.254	.677	1.289	1.658	1.980	2.358	2.617	2.860	3.160	3.373
$\infty$	.253	.674	1.282	1.645	1.960	2.326	2.576	2.807	3.090	3.291

*Q* is the upper-tail area of the distribution for *v* degrees of freedom, appropriate for use in a single-tail test. For a two-tail test, *2Q* must be used.

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## STUDENT'S t DISTRIBUTION

2.4.31342

Degrees of freedom range from 1 through 30 at intervals of 1, then 40, 60, 120,  $\infty$ ; levels of significance for a two-tailed test are .9, .8, .7, .6, .5, .4, .3, .2, .1, .05, .02, .01, .001; entries are tabulated to three decimal places; 9 pages.

Degrees of Freedom	Level of Significance												
	.9	.8	.7	.6	.5	.4	.3	.2	.1	.05	.02	.01	.001
1	.158	.325	.510	.727	1.000	1.376	1.963	3.078	6.314	12.706	31.821	63.657	636.619
2	.142	.289	.445	.617	.816	1.061	1.386	1.886	2.910	4.303	6.965	9.925	31.598
3	.137	.277	.424	.587	.765	.976	1.250	1.638	2.353	3.182	4.541	5.841	12.941
4	.134	.271	.414	.569	.741	.941	1.190	1.533	2.132	2.776	3.747	4.604	8.610
5	.132	.267	.408	.559	.727	.920	1.156	1.476	2.015	2.571	3.365	4.032	6.859
6	.131	.265	.404	.553	.718	.906	1.134	1.440	1.943	2.447	3.143	3.707	5.959
7	.130	.263	.402	.549	.711	.896	1.119	1.415	1.895	2.365	2.998	3.499	5.405
8	.130	.262	.399	.546	.706	.889	1.108	1.397	1.860	2.306	2.896	3.355	5.041
9	.129	.261	.398	.543	.703	.883	1.100	1.383	1.633	2.262	2.621	3.250	4.781
26	.127	.256	.390	.531	.684	.856	1.058	1.315	1.706	2.056	2.479	2.779	3.707
27	.127	.256	.389	.531	.684	.855	1.057	1.314	1.703	2.052	2.473	2.771	3.690
28	.127	.256	.389	.530	.683	.855	1.056	1.313	1.701	2.048	2.467	2.763	3.674
29	.127	.256	.389	.530	.683	.854	1.055	1.311	1.699	2.045	2.462	2.756	3.659
30	.127	.256	.389	.530	.683	.854	1.055	1.310	1.697	2.042	2.457	2.750	3.646
40	.126	.255	.388	.529	.681	.851	1.050	1.303	1.684	2.021	2.423	2.704	3.551
60	.126	.254	.387	.527	.679	.848	1.046	1.296	1.671	2.000	2.390	2.660	3.460
120	.126	.254	.386	.526	.677	.845	1.041	1.289	1.656	1.980	2.358	2.617	3.373
$\infty$	.126	.253	.385	.524	.674	.842	1.036	1.282	1.645	1.960	2.326	2.576	3.291

## STUDENT'S t DISTRIBUTION

2.4.40742

Degrees of freedom range from 1 through 30 at intervals of 1, as well as 40, 60, 120,  $\infty$ ; levels of significance for a two-tailed test are: 0.50, 0.25, 0.10, 0.05, 0.025, 0.01, 0.005; entries are tabulated to five significant figures; 6 pages.

P	0.50	0.25	0.10	0.05	0.025	0.01	0.005
1	1.00000	2.4142	6.3138	12.706	25.452	63.657	127.32
2	0.81650	1.6036	2.9200	4.3027	6.2053	9.9248	14.089
3	0.76489	1.4226	2.3534	3.1825	4.1765	5.8409	7.4533
4	0.74070	1.3444	2.1318	2.7764	3.4954	4.6041	5.5976
5	0.72669	1.3009	2.0150	2.5706	3.1634	4.0321	4.7733

29	0.68304	1.1739	1.6991	2.0452	2.3638	2.7564	3.0380
30	0.68276	1.1731	1.6973	2.0423	2.3596	2.7500	3.0298
40	0.68066	1.1673	1.6839	2.0211	2.3289	2.7045	2.9712
60	0.67862	1.1616	1.6707	2.0003	2.2991	2.6603	2.9146
120	0.67656	1.1559	1.6577	1.9799	2.2699	2.6174	2.8599
$\infty$	0.67449	1.1503	1.6449	1.9600	2.2414	2.5758	2.8070

## CHI-SQUARE DISTRIBUTION

CENTILE VALUES OF THE  $\chi^2$  STATISTIC

## 2.5.11412

Centile values are listed for degrees of freedom from 1 through 30; levels of significance for a two-tailed test are: .005, .01, .025, .05, .10, .25, .50, .75, .90, .95, .975, .99, .995, .999; entries are significant to two or three figures and contain one or two decimal places; 6 pages.

$df$	$\chi^2_{.005}$	$\chi^2_{.01}$	$\chi^2_{.025}$	$\chi^2_{.05}$	$\chi^2_{.10}$	$\chi^2_{.25}$	$\chi^2_{.50}$	$\chi^2_{.75}$	$\chi^2_{.90}$	$\chi^2_{.95}$	$\chi^2_{.975}$	$\chi^2_{.99}$	$\chi^2_{.995}$	$\chi^2_{.999}$
1	—	—	—	—	.02	.10	.45	1.3	2.7	3.8	5.0	6.6	7.9	10.8
2	.01	.02	.05	.10	.21	.58	1.4	2.8	4.6	6.0	7.4	9.2	10.6	13.8
3	.07	.11	.22	.35	.58	1.21	2.4	4.1	6.3	7.8	9.4	11.3	12.8	16.3
4	.21	.30	.48	.71	1.1	1.92	3.4	5.4	7.8	9.5	11.1	13.3	14.9	18.5
5	.41	.55	.83	1.1	1.6	2.7	4.4	6.6	9.2	11.1	12.8	15.1	16.7	20.5
26	11.2	12.2	13.8	15.4	17.3	20.8	25.3	30.4	35.6	38.9	41.9	45.6	48.3	54.0
27	11.8	12.9	14.6	16.2	18.1	21.7	26.3	31.5	36.7	40.1	43.2	47.0	49.6	55.5
28	12.5	13.6	15.3	16.9	18.9	22.7	27.3	32.6	37.9	41.3	44.5	48.3	51.0	56.9
29	13.1	14.3	16.0	17.7	19.8	23.6	28.3	33.7	39.1	42.6	45.7	49.6	52.3	58.3
30	13.8	15.0	16.8	18.5	20.6	24.5	29.3	34.8	40.3	43.8	47.0	50.9	53.3	59.7

PERCENTILE VALUES OF THE  $\chi^2$  STATISTIC

## 2.5.11642

Percentile values are listed for degrees of freedom from 1 through 30, then 40, 60, 100; levels of significance for a two-tailed test are: .005, .01, .02, .025, .05, .10, .25, .50, .75, .90, .95, .975, .98, .99, .995, .999; entries are significant to two, three, or four figures and contain one or two decimal places; 9 pages.

$n$	$\chi^2_{.005}$	$\chi^2_{.01}$	$\chi^2_{.02}$	$\chi^2_{.05}$	$\chi^2_{.10}$	$\chi^2_{.25}$	$\chi^2_{.50}$	$\chi^2_{.75}$	$\chi^2_{.90}$	$\chi^2_{.95}$	$\chi^2_{.975}$	$\chi^2_{.99}$	$\chi^2_{.995}$	$\chi^2_{.999}$	$n$		
1	—	—	—	—	.02	.10	.45	1.3	2.7	3.8	5.0	5.4	6.6	7.9	10.8	1	
2	.01	.02	.04	.05	.10	.21	.58	1.1	2.8	4.6	6.0	7.4	7.8	9.2	10.6	2	
3	.07	.11	.18	.22	.35	.58	1.21	2.4	4.1	6.3	7.8	9.4	9.8	11.3	12.8	3	
4	.21	.30	.43	.48	.71	1.1	1.92	3.4	5.4	7.8	9.5	11.1	11.7	13.3	14.9	4	
5	.41	.55	.75	.83	1.1	1.6	2.7	4.4	6.6	9.2	11.1	12.8	13.4	15.1	16.7	5	
26	11.2	12.2	13.4	13.8	15.4	17.3	20.8	25.3	30.4	35.6	38.9	41.9	42.9	45.6	48.3	54.0	26
27	11.8	12.9	14.1	14.6	16.2	18.1	21.7	26.3	31.5	36.7	40.1	43.2	44.1	47.0	49.6	55.5	27
28	12.5	13.6	14.8	15.3	16.9	18.9	22.7	27.3	32.6	37.9	41.3	44.5	45.4	48.3	51.0	56.9	28
29	13.1	14.3	15.6	16.0	17.7	19.8	23.6	28.3	33.7	39.1	42.6	45.7	46.7	49.6	52.4	58.3	29
30	13.8	15.0	16.3	16.8	18.5	20.6	24.5	29.3	34.8	40.3	43.8	47.0	48.0	50.9	53.3	59.7	30
40	20.7	22.2	23.8	24.4	26.5	29.1	33.7	39.3	45.0	51.8	55.8	59.3	60.4	63.7	66.8	73.5	40
60	35.5	37.5	39.7	40.5	43.2	46.6	52.3	59.3	67.0	74.4	79.1	83.3	84.6	88.4	92.0	90.7	60
100	67.3	70.0	73.1	74.2	77.9	82.4	90.1	99.3	109.1	118.6	124.3	129.6	131.1	135.8	140.2	149.5	100

## VALUES OF CHI-SQUARE AT THE 5% and 1% LEVELS OF SIGNIFICANCE

2.5.20212

Degrees of freedom range from 1 through 30 at intervals of 1; column headings are: .05, .01; entries are tabulated to two decimal places; 1 page.

DGREES OF FREEDOM (df)	5%	1%
1	3.84	6.64
2	5.99	9.21
3	7.82	11.34
4	9.49	13.28
5	11.07	15.00

26	38.88	45.64
27	40.11	46.96
28	41.34	48.28
29	42.56	49.59
30	43.77	50.89

## CRITICAL VALUES OF CHI SQUARE

2.5.20633

Degrees of freedom range from 1 through 30 at intervals of 1, then 32, 34, 36, 38, 40, 44, 48, 52, 56, 60; levels of significance for a one-tailed test are: .10, .05, .025, .01, .005, .0005 while levels of significance for a two-tailed test are: .20, .10, .05, .02, .01, .001; entries are of the form n.xx; 3 pages.

df	Level of significance for one-tailed test					
	.10	.05	.025	.01	.005	.0005
	Level of significance for two-tailed test					
df	.20	.10	.05	.02	.01	.001
1	1.64	2.71	3.84	5.41	6.64	10.83
2	3.22	4.60	5.99	7.82	9.21	13.82
3	4.64	6.25	7.82	9.84	11.34	16.27
4	5.99	7.78	9.49	11.67	13.28	18.46
5	7.29	9.24	11.07	13.39	15.09	20.52

44	51.64	56.37	60.48	65.34	68.71	78.75
48	55.99	60.91	65.17	70.20	73.68	84.04
52	60.33	65.42	69.83	75.02	78.62	89.27
56	64.68	69.92	74.47	79.82	83.51	94.46
60	68.97	74.40	79.08	84.58	88.38	99.61

Source: Table F is taken from Table IV of Fisher and Yates, *Statistical Tables for Biological, Agricultural and Medical Research*, published by Oliver and Boyd, Ltd., Edinburgh, and by permission of the authors and publishers.

The table lists the critical values of chi square for the degrees of freedom shown at the left for tests corresponding to those significance levels heading each column. If the observed value of  $\chi^2_{obs}$  is greater than or equal to the tabled value, reject  $H_0$ .

## THE CHI-SQUARE DISTRIBUTION

## 2.5.21042

Degrees of freedom for the distribution range from 1 through 30 at intervals of 1, from 30 through 100 at intervals of 10, then 120; column headings for a two-tailed test are: .995, .99, .975, .95, .90, .10, .05, .025, .01, .005; for the most part entries are tabulated to two decimal places; 6 pages.

<i>v</i>	Area in the upper tail									
	.995	.99	.975	.95	.90	.10	.05	.025	.01	.005
1	.000039	.00016	.00098	.0039	.016	2.71	3.84	5.02	6.63	7.88
2	.010	.020	.051	.10	.21	4.61	5.99	7.38	9.21	10.60
3	.072	.11	.22	.35	.58	6.25	7.81	9.35	11.34	12.84
4	.21	.30	.48	.71	1.06	7.78	9.49	11.14	13.28	14.86
5	.41	.55	.83	1.15	1.61	9.24	11.07	12.83	15.09	16.75
30	13.79	14.95	16.79	18.49	20.60	40.26	43.77	46.98	50.89	53.67
40	20.71	22.16	24.43	26.51	29.05	51.81	55.76	59.34	63.69	66.77
50	27.99	29.71	32.36	34.76	37.69	63.17	67.50	71.42	76.15	79.49
60	35.53	37.48	40.48	43.19	46.46	74.40	79.08	83.30	88.38	91.95
70	43.28	45.44	48.76	51.74	55.33	85.53	90.53	95.02	100.42	104.22
80	51.17	53.54	57.15	60.39	64.28	96.58	101.88	106.63	112.33	116.32
90	59.20	61.75	65.65	69.13	73.29	107.56	113.14	118.14	124.12	128.30
100	67.33	70.06	74.22	77.93	82.36	118.50	124.34	129.56	135.81	140.17
120	83.85	86.92	91.58	95.70	100.62	140.23	146.57	152.21	158.95	163.64

## CRITICAL VALUES OF CHI SQUARE

## 2.5.21412

Degrees of freedom range from 1 through 30; levels of significance for a two-tailed test are: .99, .98, .95, .90, .80, .70, .50, .30, .20, .10, .05, .02, .01, .001; entries are tabulated to two significant figures after the decimal point; 6 pages.

Q v	Probability under $H_0$ that $\chi^2 \geq$ chi square													
	.99	.98	.95	.90	.80	.70	.50	.30	.20	.10	.05	.02	.01	.001
1	.00016	.00063	.0039	.016	.064	.15	.46	1.07	1.64	2.71	3.84	5.41	6.64	10.83
2	.02	.04	.10	.21	.45	.71	1.39	2.41	3.22	4.60	5.99	7.82	9.21	13.82
3	.12	.18	.35	.58	1.00	1.42	2.37	3.66	4.64	6.25	7.82	9.84	11.34	16.27
4	.30	.43	.71	1.06	1.65	2.20	3.36	4.88	5.99	7.78	9.49	11.67	13.28	18.46
5	.55	.76	1.14	1.61	2.34	3.00	4.35	6.06	7.29	9.24	11.07	13.39	15.09	20.52
26	12.20	13.41	15.38	17.29	19.82	21.79	25.34	29.25	31.80	35.56	38.88	42.86	45.64	54.05
27	12.88	14.12	16.16	18.11	20.70	22.72	26.34	30.32	32.91	36.74	40.11	44.14	46.96	55.48
28	13.56	14.85	16.93	18.94	21.59	23.65	27.34	31.39	34.03	37.92	41.34	45.42	48.28	56.89
29	14.26	15.57	17.71	18.77	22.48	24.58	28.34	32.46	35.14	39.09	42.56	46.69	49.59	58.30
30	14.96	16.31	18.49	20.60	23.36	26.51	29.34	33.53	36.25	40.26	43.77	47.96	50.89	59.70

## CRITICAL VALUES OF CHI-SQUARE

2.5.30212

Degrees of freedom range from 1 through 30 at intervals of 1; levels of significance for a two-tailed test are: 0.05 and 0.01; entries are tabulated to three decimal places; 1 page.

d.f.	$\chi^2_{.05}$	$\chi^2_{.01}$	d.f.†
1	3.841	6.635	1
2	5.991	9.210	2
3	7.815	11.345	3
4	9.488	13.277	4
5	11.070	15.086	5
26	38.885	45.642	26
27	40.113	46.963	27
28	41.337	48.278	28
29	42.557	49.588	29
30	43.773	50.892	30

Table 4 is taken from Table 8 of the Biometrika  
Tables for Statisticians, Volume I, Third Edition,  
by Pearson and Hartley.

 $\chi^2$  DISTRIBUTION!

2.5.30512

Degrees of freedom range from 1 through 30 at intervals of 1; levels of significance for a two-tailed test are: .10, .05, .025, .01, .005; entries are tabulated to three decimal places; 2 pages.

df	.10	.05	.025	.01	.005
1	2.706	3.841	5.024	6.635	7.879
2	4.605	5.991	7.378	9.210	10.597
3	6.251	7.815	9.348	11.345	12.838
4	7.779	9.488	11.143	13.277	14.860
5	9.236	11.070	12.832	15.086	16.750
26	35.563	38.885	41.923	45.642	48.290
27	36.741	40.113	43.194	46.963	49.645
28	37.916	41.337	44.461	48.278	50.993
29	39.087	42.557	45.722	49.588	52.336
30	40.256	43.773	46.979	50.892	53.672

This table is an abridged version of Table III from R. A. Fisher, *Statistical Methods for Research Workers*, published by Oliver and Boyd, Ltd., Edinburgh. Reproduced by permission of the author and publishers.

## PERCENTILES OF THE $\chi^2$ DISTRIBUTION:

### 2.5.30522

Degrees of freedom range from 1 through 50 at intervals of 1; levels of significance for a two-tailed test are: .50, .75, .90, .95, .99; entries are tabulated to three decimal places; 4 pages.

<i>n</i>	.50	.75	.90	.95	.99
1	0.455	1.323	2.706	3.842	6.638
2	1.386	2.773	4.605	5.991	9.210
3	2.366	4.109	6.252	7.815	11.346
4	3.357	5.385	7.779	9.488	13.277
5	4.352	6.626	9.237	11.071	15.087

44	43.335	49.913	56.369	60.481	68.710
45	44.335	50.985	57.505	61.656	69.957
46	45.335	52.056	58.641	62.830	71.202
47	46.335	53.127	59.774	64.001	72.444
48	47.335	54.196	60.907	65.171	73.683
49	48.335	55.265	62.038	66.339	74.920
50	49.335	56.334	63.167	67.505	76.154

## CHI-SQUARE DISTRIBUTION:

### 2.5.30812

Degrees of freedom range from 1 through 30 at intervals of 1; levels of significance for a two-tailed test are: .995, .99, .975, .95, .05, .025, .01, .005; entries are tabulated to three significant figures after the decimal point; 4 pages.

d.f.	$\chi^2_{.995}$	$\chi^2_{.99}$	$\chi^2_{.975}$	$\chi^2_{.95}$	$\chi^2_{.05}$	$\chi^2_{.025}$	$\chi^2_{.01}$	$\chi^2_{.005}$	d.f.
1	.0000393	.000157	.000982	.00393	3.841	5.024	6.635	7.879	1
2	.0100	.0201	.0506	.103	5.991	7.378	9.210	10.597	2
3	.0717	.115	.216	.352	7.815	9.348	11.345	12.838	3
4	.207	.297	.484	.711	9.488	11.143	13.277	14.860	4
5	.412	.554	.831	1.145	11.070	12.833	15.086	16.750	5

26	11.160	12.198	13.844	15.379	38.885	41.923	45.642	48.290	26
27	11.803	12.879	14.573	16.151	40.113	43.194	46.963	49.645	27
28	12.461	13.565	15.308	16.928	41.337	44.461	48.278	50.993	28
29	13.121	14.256	16.047	17.708	42.557	45.722	49.588	52.336	29
30	13.787	14.953	16.791	18.493	43.773	46.979	50.892	53.672	30

Based on Table 8 of *Biometrika Tables for Statisticians, Volume I*. By permission of the Biometrika trustees.

## CHI SQUARE DISTRIBUTION

## 2.5.30912

Degrees of freedom range from 1 through 30 at intervals of 1; levels of significance for a two-tailed test are: .99, .98, .95, .90, .50, .10, .05, .02, .01; entries are tabulated to three significant figures after the decimal point; 4 pages.

Degrees of Freedom DF	Level of Significance								
	.99	.98	.95	.90	.50	.10	.05	.02	.01
1	.000157	.000628	.00393	.0158	.455	2.706	3.841	5.412	6.635
2	.0201	.0404	.103	.211	1.386	4.605	5.991	7.824	9.210
3	.115	.185	.352	.584	2.366	6.251	7.815	9.837	11.345
4	.297	.429	.711	1.064	3.357	7.779	9.488	11.668	13.277
5	.554	.752	1.145	1.610	4.351	9.236	11.070	13.388	15.086
26	12.198	13.409	15.379	17.292	25.338	35.583	38.885	42.856	45.642
27	12.879	14.125	18.151	18.114	26.338	36.741	40.113	44.140	46.963
28	13.565	14.847	18.928	18.939	27.336	37.916	41.337	45.419	48.278
29	14.256	15.574	17.708	19.768	28.336	39.087	42.557	46.693	49.588
30	14.953	16.306	18.493	20.599	29.336	40.256	43.773	47.962	50.892

VALUES OF  $\chi^2$ 

## 2.5.31312

Degrees of freedom range from 1 through 30 at intervals of 1; levels of significance for a two-tailed test are: .995, .990, .975, .950, .900, .750, .500, .250, .100, .050, .025, .010, .005; entries are generally to three significant figures; 6 pages.

DEGREES OF FREEDOM n	.995	.990	.975	.950	PROBABILITY		.900	.750	.500	.250	.100	.050	.025	.010	.005
	.900	.750	.500	.250	.100	.050	.025	.010	.005	.000	.000	.000	.000	.000	.000
1	.0000393	.000157	.000982	.00393	.0158	.102	.455	1.32	2.71	3.84	5.02	6.63	7.88		
2	.6100	.0201	.0506	.103	.211	.575	1.39	2.77	4.61	5.99	7.38	9.21	10.6		
3	.0717	.115	.216	.352	.584	1.21	2.37	4.11	6.25	7.81	9.35	11.3	12.8		
4	.207	.297	.484	.711	1.06	1.92	3.36	5.39	7.78	9.49	11.1	13.3	14.9		
5	.412	.554	.831	1.15	1.61	2.67	4.35	6.63	9.24	11.1	12.8	15.1	16.7		
6	.676	.872	1.24	1.64	2.20	3.45	5.35	7.84	10.6	12.6	14.4	16.8	18.5		
7	.989	1.24	1.69	2.17	2.83	4.25	6.35	9.04	12.0	14.1	16.0	18.5	20.3		
8	1.34	1.65	2.18	2.73	3.49	5.07	7.34	10.2	13.4	15.5	17.5	20.1	22.0		
9	1.73	2.09	2.70	3.33	4.17	5.90	8.34	11.4	14.7	16.9	19.0	21.7	23.6		
10	2.16	2.56	3.25	3.94	4.87	6.74	9.34	12.5	16.0	18.3	20.5	23.2	25.2		
26	11.2	12.2	13.8	15.4	17.3	20.8	25.3	30.4	35.6	38.9	41.9	45.6	48.3		
27	11.8	12.9	14.6	16.2	18.1	21.7	26.3	31.5	36.7	40.1	43.2	47.0	49.6		
28	12.5	13.6	15.3	16.9	18.9	22.7	27.3	32.6	37.9	41.3	44.5	48.3	51.0		
29	13.1	14.3	16.0	17.7	19.8	23.6	28.3	33.7	39.1	42.6	45.7	49.6	52.3		
30	13.8	15.0	16.8	18.3	20.6	24.5	29.3	34.8	40.3	43.8	47.0	50.9	53.7		

$\chi^2$  DISTRIBUTION

## 2.5.31412

Degrees of freedom range from 1 through 30 at intervals of 1; levels of significance for a two-tailed test are: .99, .98, .95, .90, .80, .70, .50, .30, .20, .10, .05, .02, .01, .001; entries are tabulated to three decimal places; 6 pages.

df	Probability													
	.99	.98	.95	.90	.80	.70	.50	.30	.20	.10	.05	.02	.01	.001
1	.03157	.03628	.00393	.0158	.0642	.148	.455	1.074	1.642	2.706	3.841	5.412	6.635	10.827
2	.0201	.0404	.103	.211	.446	.713	1.386	2.408	3.219	4.605	5.991	7.824	9.210	13.815
3	.115	.185	.352	.584	1.005	1.424	2.366	3.665	4.642	6.251	7.815	9.837	11.345	16.268
4	.297	.429	.711	1.064	1.649	2.195	3.357	4.878	5.989	7.779	9.488	11.668	13.277	18.465
5	.554	.752	1.145	1.610	2.343	3.000	4.351	6.064	7.289	9.236	11.070	13.388	15.086	20.517
26	12.198	13.409	15.379	17.292	19.820	21.792	25.336	29.246	31.795	35.563	38.885	42.856	45.642	54.052
27	12.879	14.125	16.151	18.114	20.703	22.719	26.336	30.319	32.912	36.741	40.113	44.140	46.963	55.476
28	13.565	14.847	16.928	18.939	21.588	23.647	27.336	31.391	34.027	37.916	41.337	45.419	48.278	56.893
29	14.256	15.574	17.708	19.768	22.475	24.577	28.336	32.461	35.139	39.087	42.557	46.693	49.588	58.302
30	14.953	16.306	18.493	20.599	23.364	25.508	29.336	33.530	36.250	40.256	43.773	47.962	50.892	59.703

 $\chi^2$  DISTRIBUTION

## 2.5.31442

Degrees of freedom range from 1 through 30 at intervals of 1, from 30 through 70 at intervals of 2; levels of significance for a two-tailed test are: .99, .98, .95, .90, .80, .70, .50, .30, .20, .10, .05, .02, .01, .001; entries are tabulated to three decimal places; 12 pages.

df	Probability													
	.99	.98	.95	.90	.80	.70	.50	.30	.20	.10	.05	.02	.01	.001
1	.00016	.00663	.00393	.0158	.0642	.148	.455	1.074	1.642	2.706	3.841	5.412	6.635	10.827
2	.0201	.0404	.103	.211	.446	.713	1.386	2.408	3.219	4.605	5.991	7.824	9.210	13.815
3	.115	.185	.352	.584	1.005	1.424	2.366	3.665	4.642	6.251	7.815	9.837	11.345	16.268
4	.297	.429	.711	1.064	1.649	2.195	3.357	4.878	5.989	7.779	9.488	11.668	13.277	18.465
5	.554	.752	1.145	1.610	2.343	3.000	4.351	6.064	7.289	9.236	11.070	13.388	15.086	20.517
32	16.362	17.783	20.072	22.271	25.148	27.373	31.336	35.665	38.466	42.585	46.194	50.487	53.486	62.487
34	17.789	19.275	21.664	23.952	26.938	29.242	33.336	37.795	40.676	44.903	48.602	52.995	56.061	65.247
36	19.233	20.783	23.269	25.643	28.735	31.115	35.336	39.922	42.879	47.212	50.999	55.489	58.619	67.985
38	20.691	22.304	24.884	27.343	30.537	32.992	37.335	42.045	45.076	49.513	53.384	57.969	61.162	70.703
40	22.164	23.838	26.509	29.051	32.345	34.872	39.335	44.165	47.269	51.805	55.759	60.436	63.691	73.402
62	39.063	41.327	44.889	48.226	52.487	55.714	61.335	67.322	71.125	76.630	81.381	86.953	90.802	102.166
64	40.649	42.960	46.595	49.996	54.336	57.620	63.335	69.416	73.276	78.860	83.675	89.320	93.217	104.716
66	42.240	44.599	48.305	51.770	56.188	59.527	65.335	71.508	75.424	81.085	85.965	91.681	95.626	107.258
68	43.838	46.244	50.020	53.548	58.042	61.436	67.335	73.600	77.571	83.308	88.250	94.037	98.028	109.791
70	45.442	47.893	51.739	55.329	59.898	63.346	69.334	75.689	79.715	85.527	90.531	96.388	100.425	112.317

$\chi^2$  DISTRIBUTION

2.5.41442

Degrees of freedom range from 1 through 30 at intervals of 1, then 40, 50, 60, 70, 80, 90, 100; levels of significance for a two-tailed test are: 0.995, 0.990, 0.975, 0.950, 0.900, 0.750, 0.500, 0.250, 0.100, 0.050, 0.025, 0.010, 0.005, 0.001; entries are tabulated to six significant figures; 12 pages.

<del>df</del>	0.995	0.990	0.975	0.950	0.900	0.750	0.500
1	392704.10 <sup>-10</sup>	157088.10 <sup>-9</sup>	982069.10 <sup>-8</sup>	393214.10 <sup>-8</sup>	0.0157908	0.1015308	0.454937
2	0.0100251	0.0201007	0.0506356	0.102587	0.210720	0.575364	1.38629
3	0.0717212	0.114832	0.215795	0.351846	0.584375	1.212534	2.36597
4	0.206990	0.297110	0.484419	0.710721	1.063623	1.92255	3.35670
5	0.411740	0.554300	0.831211	1.145476	1.61031	2.67460	4.35146
6	0.675727	0.872085	1.237347	1.63539	2.20413	3.45460	5.34812
7	0.989265	1.239043	1.68987	2.16735	2.83311	4.25485	6.34581
8	1.344419	1.646482	2.17973	2.73264	3.48954	5.07064	7.34412
9	1.734926	2.087912	2.70039	3.32511	4.16816	5.89883	8.34283

30	13.7867	14.9535	16.7908	18.4926	20.5992	24.4776	29.3360
40	20.7065	22.1643	24.4331	26.5093	29.0505	33.6603	39.3354
50	27.9907	29.7067	32.3574	34.7642	37.6886	42.9421	49.3349
60	35.5346	37.4848	40.4817	43.1879	46.4589	52.2938	59.3347
70	43.2752	45.4418	48.7576	51.7393	55.3290	61.6983	69.3344
80	51.1720	53.5400	57.1532	60.3915	64.2778	71.1445	79.3343
90	59.1963	61.7541	65.6466	69.1260	73.2912	80.6247	89.3342
100	67.3276	70.0648	74.2219	77.9295	82.3581	90.1332	99.3341

<del>df</del>	0.250	0.100	0.050	0.025	0.010	0.005	0.001
1	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944	10.828
2	2.77259	4.60517	5.99147	7.37776	9.21034	10.5966	13.816
3	4.10835	6.25139	7.81473	9.34840	11.3449	12.8381	16.266
4	5.38527	7.77944	9.48773	11.1433	13.2767	14.8602	18.467
5	6.62568	9.23635	11.0705	12.8325	15.0863	16.7496	20.515
6	7.84080	10.6446	12.5916	14.4494	16.8119	18.5476	22.458
7	9.03715	12.0170	14.0671	16.0128	18.4753	20.2777	24.322
8	10.2188	13.3616	15.5073	17.5346	20.0902	21.9550	26.125
9	11.3887	14.6837	16.9190	19.0228	21.6660	23.5893	27.877

30	34.7998	40.2560	43.7729	46.9792	50.8922	53.6720	59.703
40	45.6160	51.8050	55.7585	59.3417	63.6907	66.7659	73.402
50	56.3336	63.1671	67.5048	71.4202	76.1539	79.4900	86.661
60	66.9814	74.3970	79.0819	83.2976	88.3794	91.9517	99.607
70	77.5766	85.5271	90.5312	95.0231	100.425	104.215	112.317
80	88.1303	96.5782	101.879	106.629	112.329	116.321	124.839
90	98.6499	107.565	113.145	118.136	124.116	128.299	137.208
100	109.141	118.498	124.342	129.561	135.807	140.169	149.449

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## CRITICAL VALUES OF CHI-SQUARE DISTRIBUTION

2.5.60443

Values are listed for degrees of freedom from 1 through 30 at intervals of 1, then 40, 50, 60, 70, 80, 90, 100; levels of significance for a one-tailed test are: .005, .01, .025, .05, while for a two tailed test levels of significance are: .01, .02, .05, .10; entries are tabulated to six significant figures; a note explains the arrangement of the table; 7 pages.

df	Lower tail of distribution				Upper tail of distribution			
	.005	.01	.025	.05	.05	.025	.01	.005
a, one-tail test					.01	.02	.05	.10
a, two-tail test					.10	.05	.02	.01
df	(Tabulated value is upper bound to alpha)				(Tabulated value is lower bound to alpha)			
1	$392704 \cdot 10^{-10}$	$157088 \cdot 10^{-9}$	$982069 \cdot 10^{-9}$	$393214 \cdot 10^{-8}$	3.84146	5.02389	6.63490	7.87944
2	0.0100251	0.0201007	0.0506356	0.102587	5.99146	7.37776	9.21034	10.5966
3	0.0717218	0.114832	0.215795	0.351846	7.81473	9.34840	11.3449	12.8382
4	0.206989	0.297109	0.484419	0.710723	9.48773	11.1433	13.2767	14.8603
5	0.411742	0.554298	0.831212	1.145476	11.0705	12.8325	15.0863	16.7496
6	0.675727	0.872090	1.23734	1.63538	12.5916	14.4494	16.8119	18.5476
7	0.989256	1.239043	1.68987	2.16735	14.0671	16.0128	18.4753	20.2777
8	1.34441	1.64650	2.17973	2.73264	15.5073	17.5345	20.0902	21.9550
9	1.73493	2.08790	2.70039	3.32511	16.9190	19.0228	21.6660	23.5894
28	12.4613	13.5647	15.3079	16.9279	41.3371	44.4608	48.2782	50.9934
29	13.1211	14.2565	16.0471	17.7084	42.5570	45.7223	49.5879	52.3356
30	13.7867	14.9535	16.7908	18.4927	43.7730	46.9792	50.8922	53.6720
40	20.7065	22.1643	24.4330	26.5093	55.7585	59.3417	63.6907	66.7660
50	27.9907	29.7067	32.3574	34.7643	67.5048	71.4202	76.1539	79.4900
60	35.5345	37.4849	40.4817	43.1880	79.0819	83.2977	88.3794	91.9517
70	43.2752	45.4417	48.7576	51.7393	90.5312	95.0232	100.425	104.215
80	51.1719	53.5401	57.1532	60.3915	101.879	106.629	112.329	116.321
90	59.1963	61.7541	65.6466	69.1260	113.145	118.136	124.116	128.299
100	67.3276	70.0649	74.2219	77.9295	124.342	129.561	135.807	140.169

$\chi^2$  DISTRIBUTION

2.5.60642

Under  $v$ , degrees of freedom range from 1 through 30 at intervals of 1, as well as 40, 50, 60, 70, 80, 90, 100; under  $P$ , levels of significance for a two-tailed test are: 0.995, 0.975, 0.050, 0.025, 0.010, 0.005; entries are tabulated to six significant figures; 6 pages.

$v \backslash P$	0.995	0.975	0.050	0.025	0.010	0.005
1	0.043927	0.039821	3.84146	5.02389	6.63490	7.87944
2	0.010025	0.050636	5.99147	7.37776	9.21034	10.5966
3	0.071721	0.215795	7.81473	9.34840	11.3449	12.8381
4	0.206990	0.484419	9.48773	11.1433	13.2767	14.8602
5	0.411740	0.831211	11.0705	12.8325	15.0863	16.7496
6	0.675727	1.237347	12.5916	14.4494	16.8119	18.5476
7	0.989265	1.68987	14.0671	16.0128	18.4753	20.2777
8	1.344419	2.17973	15.5073	17.5346	20.0902	21.9550
9	1.734926	2.70039	16.9190	19.0228	21.6660	23.5893
30	13.7867	16.7908	43.7729	46.9792	50.8922	53.6720
40	20.7065	24.4331	55.7585	59.3417	63.6907	66.7659
50	27.9907	32.3574	67.5048	71.4202	76.1539	79.4900
60	35.5346	40.4817	79.0819	83.2976	88.3794	91.9517
70	43.2752	48.7576	90.5312	95.0231	100.425	104.215
80	51.1720	57.1532	101.879	106.629	112.329	116.321
90	59.1963	65.6466	113.145	118.136	124.116	128.299
100	67.3276	74.2219	124.342	129.561	135.807	140.169

**F DISTRIBUTION:****VALUES OF F .01****2.6.11401**

Row headings indicate degrees of freedom for the denominator and range from 1 through 50 at intervals of 1; column headings indicate degrees of freedom for the numerator and have values of 1, 3, 5, 10, 12, 15, 16, 20, 25, 28, 30, 35, 40, 45; entries are tabulated to one decimal; 12 pages.

Horizontal degrees of freedom														
	1	3	5	10	12	15	16	20	25	28	30	35	40	45
1	4051.4	5403.7	5764.0	6055.9	6106.3	6157.7	6170.1	6208.7	6240.2	6253.2	6260.6	6275.9	6286.8	6295.8
2	98.5	99.2	99.3	99.4	99.4	99.4	99.4	99.4	99.5	99.5	99.5	99.5	99.5	99.5
3	34.1	29.5	28.2	27.2	27.1	26.9	26.8	26.7	26.6	26.5	26.5	26.5	26.4	26.4
4	21.2	16.7	15.5	14.5	14.4	14.2	14.2	14.0	13.9	13.9	13.9	13.8	13.7	13.7
5	16.3	12.1	11.0	10.0	9.9	9.7	9.7	9.6	9.4	9.4	9.4	9.3	9.3	9.3
6	13.7	9.8	8.7	7.9	7.7	7.6	7.5	7.4	7.3	7.3	7.2	7.2	7.1	7.1
45	7.2	4.3	3.5	2.7	2.6	2.5	2.4	2.3	2.2	2.2	2.1	2.1	2.1	2.0
46	7.2	4.2	3.4	2.7	2.6	2.5	2.4	2.3	2.2	2.2	2.1	2.1	2.0	2.0
47	7.2	4.2	3.4	2.7	2.6	2.4	2.4	2.3	2.2	2.1	2.1	2.1	2.0	2.0
48	7.2	4.2	3.4	2.7	2.6	2.4	2.4	2.3	2.2	2.1	2.1	2.1	2.0	2.0
49	7.2	4.2	3.4	2.7	2.6	2.4	2.4	2.3	2.2	2.1	2.1	2.1	2.0	2.0
50	7.2	4.2	3.4	2.7	2.6	2.4	2.4	2.3	2.2	2.1	2.1	2.0	2.0	2.0

**VALUES OF F .05****2.6.11405**

Row headings indicate degrees of freedom for the denominator and range from 1 through 50 at intervals of 1; column headings indicate degrees of freedom for the numerator and have values of 1, 3, 5, 10, 12, 15, 16, 20, 25, 28, 30, 35, 40, 45; entries are tabulated to one decimal; 12 pages..

Horizontal degrees of freedom														
	1	3	5	10	12	15	16	20	25	28	30	35	40	45
1	161.5	215.7	230.2	241.9	243.9	246.0	246.5	248.0	249.3	249.8	250.1	250.7	251.1	251.6
2	18.5	19.2	19.3	19.4	19.4	19.4	19.4	19.4	19.5	19.5	19.5	19.5	19.5	19.5
3	10.1	9.3	9.0	8.8	8.7	8.7	8.7	8.7	8.6	8.6	8.6	8.6	8.6	8.6
4	7.7	6.6	6.3	6.0	5.9	5.9	5.8	5.8	5.8	5.8	5.7	5.7	5.7	5.7
5	6.6	5.4	5.0	4.7	4.7	4.6	4.6	4.6	4.5	4.5	4.5	4.5	4.5	4.5
6	6.0	4.8	4.4	4.1	4.0	3.9	3.9	3.9	3.8	3.8	3.8	3.8	3.8	3.8
45	4.1	2.8	2.4	2.1	2.0	1.9	1.9	1.8	1.8	1.7	1.7	1.7	1.7	1.6
46	4.1	2.8	2.4	2.0	2.0	1.9	1.9	1.8	1.7	1.7	1.7	1.7	1.7	1.6
47	4.0	2.8	2.4	2.0	2.0	1.9	1.9	1.8	1.7	1.7	1.7	1.7	1.6	1.6
48	4.0	2.8	2.4	2.0	2.0	1.9	1.9	1.8	1.7	1.7	1.7	1.7	1.6	1.6
49	4.0	2.8	2.4	2.0	2.0	1.9	1.9	1.8	1.7	1.7	1.7	1.7	1.6	1.6
50	4.0	2.8	2.4	2.0	2.0	1.9	1.9	1.8	1.7	1.7	1.7	1.7	1.6	1.6

## VALUES OF F .10

## 2.6. 11410

Row headings indicate degrees of freedom for the denominator and range from 1 through 50 at intervals of 1; column headings indicate degrees of freedom for the numerator and have values of 1, 3, 5, 10, 12, 15, 16, 20, 25, 28, 30, 35, 40, 45; entries are tabulated to one decimal place; 12 pages.

	Horizontal degrees of freedom													
	1	3	5	10	12	15	16	20	25	28	30	35	40	45
1	39.9	53.6	57.2	60.2	60.7	61.2	61.4	61.7	62.1	62.2	62.3	62.4	62.5	62.6
2	8.5	9.2	9.3	9.4	9.4	9.4	9.4	9.4	9.5	9.5	9.5	9.5	9.5	9.5
3	5.5	5.4	5.3	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2
4	4.5	4.2	4.1	3.9	3.9	3.9	3.9	3.8	3.8	3.8	3.8	3.8	3.8	3.8
5	4.1	3.6	3.5	3.3	3.3	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
6	3.8	3.3	3.1	2.9	2.9	2.9	2.9	2.8	2.8	2.8	2.8	2.8	2.8	2.8
45	2.8	2.2	2.0	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.5
46	2.8	2.2	2.0	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.5
47	2.6	2.2	2.0	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.5
48	2.8	2.2	2.0	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.5
49	2.8	2.2	2.0	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.5
50	2.8	2.2	2.0	1.7	1.7	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.5	1.5

## VALUES OF F .01

## 2.6.22101

Row headings indicate degrees of freedom for the denominator and range from 1 through 12 at intervals of 1, from 12 through 20 at intervals of 2, then 25, from 30 through 100 at intervals of 10, then 200,  $\infty$ ; column headings indicate degrees of freedom for the numerator and have values from 1 through 6 at intervals of 1, then 8, 12, 24,  $\infty$ ; entries (in bold-face type, the lower of the double listings) are tabulated to two decimal places; 4 pages.

## VALUES OF F .05

## 2.6.22105

Row headings indicate degrees of freedom for the denominator and range from 1 through 12 at intervals of 1, from 12 through 20 at intervals of 2, then 25, from 30 through 100 at intervals of 10, then 200,  $\infty$ ; column headings indicate degrees of freedom for the numerator and have values from 1 through 6 at intervals of 1, then 8, 12, 24,  $\infty$ ; entries (in roman type, the upper of the double listings) are tabulated to two decimal places; 4 pages. F FOR .05 (ROMAN) and .01 (BOLDFACE) LEVELS OF SIGNIFICANCE

Degrees of Freedom for Greater Mean Square											
	1	2	3	4	5	6	8	12	24	$\infty$	
1	161.45	199.50	215.72	224.57	230.17	233.97	235.89	243.91	249.04	254.32	
	4052.10	4999.03	5403.49	5625.14	5764.08	5859.39	5981.34	6108.83	6234.18	6366.48	
2	18.51	19.00	19.16	19.25	19.30	19.33	19.37	19.41	19.45	19.50	
	98.48	99.01	99.17	99.28	99.30	99.33	99.36	99.42	99.46	99.50	
3	10.19	9.55	9.28	9.12	9.01	8.94	8.84	8.74	8.64	8.53	
	34.12	30.81	29.46	28.71	28.24	27.91	27.49	27.05	26.60	26.12	
4	7.71	6.94	6.59	6.39	6.26	6.16	6.04	5.91	5.77	5.63	
	21.20	18.00	16.69	15.98	15.83	15.21	14.80	14.37	13.93	13.46	
5	6.61	5.79	5.41	5.19	5.05	4.95	4.82	4.68	4.53	4.36	
	16.28	13.27	12.08	11.38	10.97	10.67	10.27	9.89	9.47	8.02	
14	4.60	3.74	3.34	3.11	2.96	2.85	2.70	2.53	2.33	2.13	
	8.86	6.81	6.58	6.03	4.89	4.48	4.14	3.80	3.43	3.00	
16	4.49	3.63	3.24	3.01	2.85	2.74	2.59	2.42	2.24	2.01	
	8.53	6.23	5.20	4.77	4.44	4.20	3.89	3.58	3.18	2.78	
18	4.41	3.55	3.16	2.93	2.77	2.66	2.51	2.34	2.15	1.92	
	8.28	6.01	5.00	4.58	4.28	4.01	3.71	3.37	3.01	2.57	
30	4.03	3.18	2.79	2.56	2.40	2.29	2.13	1.95	1.74	1.44	
	7.17	5.06	4.20	3.72	3.41	3.19	3.00	2.86	3.16	1.68	
60	4.00	3.15	2.76	2.52	2.37	2.25	2.10	1.92	1.70	1.39	
	7.08	4.98	4.13	3.65	3.34	3.13	2.93	3.50	3.12	1.80	
70	3.98	3.13	2.74	2.50	2.35	2.23	2.07	1.89	1.67	1.35	
	7.01	4.92	4.07	3.60	3.28	3.07	2.78	3.48	3.07	1.83	
90	3.95	3.10	2.71	2.47	2.32	2.20	2.04	1.86	1.64	1.28	
	6.93	4.85	4.01	3.53	3.23	3.01	2.73	3.38	3.00	1.43	
100	3.94	3.09	2.70	2.46	2.30	2.19	2.03	1.85	1.63	1.26	
	6.90	4.82	3.98	3.51	3.21	2.99	2.89	3.37	1.98	1.38	
200	3.89	3.04	2.65	2.42	2.26	2.14	1.98	1.80	1.57	1.14	
	6.97	4.71	3.88	3.41	3.11	3.09	2.80	3.38	1.88	1.31	
-	3.84	2.99	2.60	2.37	2.21	2.09	1.94	1.75	1.52		
	6.84	4.60	3.78	3.33	3.02	2.80	2.51	2.18	1.70		

Table 3 is abridged from Table F of H. F. Garrett, *Statistics in Psychology and Education*, 5th edition, David McKay Co., Inc., New York, 1958, by permission of the author and publishers.

## F DISTRIBUTION

## 2.6.22320

Parameters in the table are (a) levels of significance, the percentages which are: 0.1, 0.5, 1, 2.5, 5, 10, 20; (b) degrees of freedom for the numerator (column headings) which are: 1, 2, 3, 4, 5, 6, 8, 12, 24,  $\infty$ ; (c) degrees of freedom (row headings) for the denominator which range 1 through 30 at intervals of 1, then 40, 60, 120,  $\infty$ ; for the most part entries are tabulated to two decimal places; 34 pages.

$d_f$	1	2	3	4	5	6	8	12	24	$\infty$	
$d_h$	1	2	3	4	5	6	8	12	24	$\infty$	
1	0.1% 0.5% 1% 2.5% 5% 10% 20%	405284 16211 4052 647.79 161.45 39.86 9.47	500000 20000 4999 799.50 199.50 49.50 12.00	540379 21615 5403 864.16 215.71 53.59 13.06	562500 22500 5625 899.58 224.58 55.83 13.73	576405 23056 5764 921.83 230.16 57.24 13.73	585937 23437 5859 937.11 233.99 58.20 14.01	598144 23925 5981 956.86 238.88 59.44 14.26	610667 24426 6106 976.71 243.91 60.70 14.59	623497 24940 6234 997.25 249.05 62.00 14.90	636619 25465 6366 1018.30 254.32 63.33 15.58
2	0.1 0.5 1 2.5 5 10 20	998.5 198.50 98.49 38.51 18.51 8.53 3.55	999.0 199.00 99.17 39.00 19.00 9.00 4.00	999.2 199.17 99.25 39.17 19.16 9.16 4.16	999.3 199.30 99.30 39.30 19.30 9.33 4.28	999.3 199.30 99.33 39.33 19.37 9.33 4.32	999.4 199.37 99.38 39.37 19.37 9.37 4.36	999.4 199.42 99.42 39.42 19.41 9.41 4.40	999.5 199.46 99.46 39.46 19.45 9.45 4.44	999.5 199.51 99.50 39.50 19.50 9.49 4.48	
3	0.1 0.5 1 2.5 5 10 20	187.5 55.55 34.12 17.44 10.13 5.54 2.68	148.5 49.80 30.81 29.46 9.55 9.28 2.89	141.1 47.47 28.71 15.10 9.12 5.34 2.94	137.1 46.20 28.24 14.89 9.01 5.31 2.96	134.6 45.39 27.91 14.74 8.94 5.28 2.97	132.8 44.84 27.49 14.54 8.84 5.25 2.98	130.6 44.13 27.05 14.34 8.74 5.22 2.98	128.8 43.39 26.60 14.12 8.64 5.18 2.98	125.9 42.82 26.12 13.90 8.53 5.18 2.98	
4	0.1 0.5 1 2.5 5 10 20	74.14 31.33 21.20 12.22 7.71 4.34 2.35	61.25 26.28 18.00 10.65 6.94 4.32 2.47	56.18 24.26 15.98 9.98 6.59 4.19 2.48	53.44 23.16 15.52 9.60 6.39 4.11 2.48	51.71 22.46 15.21 9.36 6.26 4.05 2.47	50.53 21.98 15.21 9.20 6.16 4.01 2.47	49.00 21.35 20.71 8.98 6.04 3.95 2.47	47.41 20.71 20.03 8.75 5.91 3.90 2.46	45.77 19.33 19.33 8.51 5.77 3.83 2.43	
5	0.1 0.5 1 2.5 5 10 20	47.04 22.79 16.26 10.01 6.51 4.06 2.18	36.61 18.31 16.53 8.43 5.79 3.78 2.36	33.20 16.53 15.56 7.76 5.41 3.62 2.25	31.09 15.56 14.94 7.39 5.19 3.52 2.24	29.75 14.94 14.51 7.15 5.05 3.45 2.23	28.84 14.51 13.96 6.98 4.95 3.40 2.22	27.64 13.96 13.38 6.76 4.82 3.34 2.20	26.42 13.38 12.78 6.52 4.68 3.27 2.18	25.14 12.14 12.14 6.02 4.38 3.10 2.18	
30	0.1 0.5 1 2.5 5 10 20	13.29 9.18 7.56 5.57 4.17 2.88 1.72	8.77 6.35 5.39 4.18 3.32 2.49 1.70	7.05 5.24 4.51 3.59 2.92 2.28 1.64	6.13 4.62 4.02 3.25 2.69 2.14 1.60	5.53 4.23 3.70 3.03 2.53 2.05 1.57	5.12 3.95 3.47 2.87 2.53 1.98 1.54	4.58 3.58 3.17 2.87 2.42 1.88 1.54	4.00 3.18 2.84 2.41 2.27 1.77 1.45	3.38 2.73 2.47 2.14 1.89 1.64 1.38	
40	0.1 0.5 1 2.5 5 10 20	12.61 8.83 7.31 5.42 4.08 2.84 1.70	8.25 6.07 5.18 4.05 3.23 2.44 1.68	6.60 4.98 4.31 3.46 2.84 2.23 1.62	5.70 4.37 3.83 3.13 2.61 2.09 1.57	5.13 3.99 3.61 3.13 2.45 2.00 1.54	4.73 3.71 3.29 2.74 2.34 1.93 1.51	4.21 3.35 2.99 2.53 2.18 1.71 1.47	3.64 2.95 2.66 2.29 2.00 1.70 1.41	3.01 2.50 1.93 1.64 1.38 1.17 1.24	
60	0.1 0.5 1 2.5 5 10 20	11.97 8.49 7.08 5.29 4.00 2.79 1.68	7.76 5.80 4.98 3.93 3.15 2.39 1.65	6.17 4.73 4.13 3.34 2.76 2.18 1.59	5.31 4.14 3.65 3.01 2.52 2.04 1.55	4.76 3.76 3.34 2.79 2.37 1.95 1.51	4.37 3.71 3.29 2.63 2.25 1.87 1.48	3.87 3.13 2.82 2.41 2.17 1.77 1.44	3.31 2.74 2.50 2.17 1.88 1.66 1.38	2.09 1.69 1.40 1.18 1.00 0.81 1.18	
120	0.1 0.5 1 2.5 5 10 20	11.38 8.18 6.85 5.15 3.92 2.75 1.66	7.31 5.54 4.79 3.80 3.07 2.35 1.63	5.79 4.50 3.95 3.23 2.68 2.13 1.57	4.95 3.92 3.48 2.89 2.45 1.99 1.52	4.42 3.55 3.17 2.67 2.29 1.90 1.48	4.04 3.28 2.96 2.52 2.17 1.82 1.45	3.55 2.93 2.66 2.30 2.02 1.72 1.41	3.02 2.54 2.34 2.05 1.83 1.60 1.35	2.40 2.09 1.95 1.76 1.61 1.45 1.27	
$\infty$	0.1 0.5 1 2.5 5 10 20	10.83 7.88 6.64 5.02 3.84 2.71 1.64	6.91 5.30 4.60 3.69 2.99 2.30 1.61	5.42 4.28 3.78 3.12 2.60 2.08 1.55	4.62 3.72 3.32 2.79 2.37 1.94 1.46	4.10 3.35 3.02 2.60 2.21 1.85 1.43	3.74 3.09 2.74 2.51 2.19 1.94 1.43	3.27 2.74 2.36 2.18 1.94 1.64 1.38	2.74 2.36 1.90 1.79 1.64 1.52 1.00	2.13 1.00 1.00 1.00 1.00 1.00 1.00	

## 2.6.23201.

Row headings indicate degrees of freedom for the denominator and range from 1 through 25 at intervals of 1, then 30, 40, 60, 120,  $\infty$ ; column headings indicate degrees of freedom for the numerator and have values from 1 through 10 at intervals of 1, then 12, 15, 20, 24, 30, 40, 60, 120,  $\infty$ ; for the most part, entries are tabulated to two decimal places; 8 pages.

degrees of freedom for numerator

	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	$\infty$
1	4052	5000	5403	5625	5764	5859	5928	5982	6023	6056	6106	6157	6209	6235	6261	6287	6313	6339	6366
2	98.5	99.0	99.2	99.3	99.3	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.4	99.5	99.5	99.5	99.5	99.5
3	34.1	30.8	29.5	28.7	28.2	27.9	27.5	27.3	27.2	27.1	26.9	26.7	26.6	26.5	26.4	26.3	26.2	26.2	26.1
4	21.2	18.0	16.7	16.0	15.5	15.2	15.0	14.8	14.7	14.5	14.2	14.0	13.9	13.8	13.7	13.7	13.6	13.5	13.5
5	16.3	13.3	12.1	11.4	11.0	10.7	10.5	10.3	10.2	10.1	9.89	9.72	9.55	9.47	9.38	9.29	9.20	9.11	9.02
30	7.56	5.39	4.51	4.02	3.70	3.47	3.30	3.17	3.07	2.98	2.84	2.70	2.55	2.47	2.39	2.30	2.21	2.11	2.01
40	7.31	5.18	4.31	3.83	3.51	3.29	3.12	2.99	2.89	2.80	2.66	2.52	2.37	2.29	2.20	2.11	2.02	1.92	1.80
60	7.08	4.98	4.13	3.65	3.34	3.12	2.95	2.82	2.72	2.63	2.50	2.35	2.20	2.12	2.03	1.94	1.84	1.73	1.60
120	6.85	4.79	3.95	3.48	3.17	2.96	2.79	2.66	2.56	2.47	2.34	2.19	2.03	1.95	1.86	1.76	1.66	1.53	1.38
$\infty$	6.63	4.61	3.78	3.32	3.02	2.80	2.64	2.51	2.41	2.32	2.18	2.04	1.88	1.79	1.70	1.59	1.47	1.32	1.00

## VALUES OF F .05

## 2.6.23205

Row headings indicate degrees of freedom for the denominator and range from 1 through 25 at intervals of 1, then 30, 40, 60, 120,  $\infty$ ; column headings indicate degrees of freedom for the numerator and have values from 1 through 10 at intervals of 1, then 12, 15, 20, 24, 30, 40, 60, 120,  $\infty$ ; for the most part, entries are tabulated to two decimal places; 8 pages.

degrees of freedom for numerator

	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	$\infty$
1	161	200	216	225	230	234	237	239	241	242	244	246	248	249	250	251	252	253	254
2	18.5	19.0	19.2	19.3	19.3	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.5	19.5	19.5	19.5	19.5	19.5
3	10.1	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.70	8.66	8.62	8.59	8.57	8.55	8.53	8.53
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.37
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.62
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.51
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99	1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47	1.39
120	3.92	3.07	2.68	2.45	2.29	2.18	2.09	2.02	1.96	1.91	1.83	1.75	1.66	1.61	1.55	1.50	1.43	1.35	1.25
$\infty$	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83	1.75	1.67	1.57	1.52	1.46	1.39	1.32	1.22	1.00

Abridged from M. Merrington and C. M. Thompson, "Tables of percentage points of the inverted beta ( $F$ ) distribution," *Biometrika*, Vol. 33, 1943, p. 71. By permission of the *Biometrika* trustees.

Row headings indicate degrees of freedom for the denominator and range from 1 through 30 at intervals of 1, then 40, 60, 120,  $\infty$ ; column headings indicate degrees of freedom for the numerator and have values from 1 through 10 at intervals of 1, then 12, 15, 20, 24, 30, 40, 60, 120,  $\infty$ ; for the most part, entries are tabulated to two decimals; 15 pages.

$m \backslash n$	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	$\infty$
1	16211	21615	22500	23056	23437	23715	23925	24091	24224	24426	24630	24836	24940	25044	25148	25253	25359	25465	
2	198.5	199.0	199.2	199.3	199.4	199.4	199.4	199.4	199.4	199.4	199.4	199.4	199.4	199.4	199.4	199.4	199.4	199.4	
3	55.55	55.55	55.55	55.55	55.55	55.55	55.55	55.55	55.55	55.55	55.55	55.55	55.55	55.55	55.55	55.55	55.55	55.55	
4	31.33	31.33	31.33	31.33	31.33	31.33	31.33	31.33	31.33	31.33	31.33	31.33	31.33	31.33	31.33	31.33	31.33	31.33	

$m \backslash n$	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	$\infty$
30	9.18	6.35	5.24	4.62	4.23	3.96	3.74	3.58	3.45	3.34	3.18	3.01	2.82	2.73	2.63	2.52	2.42	2.30	
40	8.83	6.07	4.98	4.37	3.99	3.71	3.51	3.35	3.22	3.12	2.95	2.78	2.60	2.50	2.40	2.30	2.18	2.06	
60	8.49	5.79	4.73	4.14	3.76	3.49	3.29	3.13	3.01	2.90	2.74	2.57	2.39	2.29	2.19	2.08	1.96	1.83	
120	8.18	5.54	4.50	3.92	3.55	3.28	3.09	2.93	2.81	2.71	2.54	2.37	2.19	2.09	1.98	1.87	1.75	1.61	
$\infty$	7.88	5.30	4.28	3.72	3.35	3.09	2.90	2.74	2.62	2.52	2.36	2.19	2.00	1.90	1.79	1.67	1.53	1.36	

## VALUES OF F .01

## 2.6.23301

Row headings indicate degrees of freedom for the denominator and range from 1 through 30 at intervals of 1, then 40, 60, 120,  $\infty$ ; column headings indicate degrees of freedom for the numerator and have values from 1 through 10 at intervals of 1, then 12, 15, 20, 24, 30, 40, 60, 120,  $\infty$ ; for the most part, entries are tabulated to two decimal places; 12 pages.

$m \backslash n$	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	$\infty$
1	4052	4999.5	5403	5695	5704	5639	5982	6022	6056	6106	6157	6209	6235	6261	6287	6313	6339	6366	
2	98.50	99.00	99.17	99.25	99.30	99.33	99.36	99.37	99.39	99.40	99.42	99.45	99.46	99.47	99.48	99.49	99.50	99.50	
3	34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.45	27.23	26.87	26.69	26.50	26.41	26.32	26.22	26.13	26.13	26.13	
4	21.20	18.00	16.69	15.98	15.82	15.21	14.98	14.80	14.66	14.55	14.37	14.20	14.02	13.93	13.75	13.65	13.56	13.46	

## VALUES OF F .001

## 2.6.233001

Row headings indicate degrees of freedom for the denominator and range from 1 through 30 at intervals of 1, then 40, 60, 120,  $\infty$ ; column headings indicate degrees of freedom for the numerator and have values from 1 through 10 at intervals of 1, then 12, 15, 20, 24, 30, 40, 60, 120,  $\infty$ ; for the most part, entries are tabulated to two decimals; 15 pages.

$m \backslash n$	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	$\infty$
1	7.56	5.39	4.51	4.02	3.70	3.47	3.30	3.17	3.07	2.98	2.70	2.55	2.47	2.39	2.30	2.21	2.11	2.01	
2	7.31	5.18	4.31	3.83	3.51	3.28	3.12	2.99	2.89	2.80	2.66	2.52	2.47	2.37	2.29	2.20	2.11	2.02	
3	7.08	4.98	4.13	3.66	3.34	3.05	2.95	2.82	2.72	2.63	2.50	2.35	2.26	2.12	2.03	1.94	1.84	1.73	
4	6.85	4.79	3.95	3.48	3.17	2.96	2.79	2.66	2.56	2.47	2.34	2.19	2.03	1.95	1.86	1.76	1.66	1.53	
$\infty$	6.63	4.61	3.78	3.32	3.03	2.80	2.64	2.51	2.41	2.32	2.18	2.04	1.88	1.79	1.70	1.59	1.47	1.32	

## VALUES OF F .025

## 2.6.233025

Row headings indicate degrees of freedom for the denominator and range from 1 through 30 at intervals of 1, then 40, 60, 120,  $\infty$ ; column headings indicate degrees of freedom for the numerator and have values from 1 through 10 at intervals of 1, then 12, 15, 20, 24, 30, 40, 60, 120,  $\infty$ ; for the most part, entries are tabulated to two decimal places; 12 pages.

$n \backslash m$	1	2	3	4	6	7	8	9	10	12	15	18	20	24	30	40	60	120	$\infty$
1	647.8	799.5	804.2	809.6	921.8	937.1	948.2	956.7	963.3	969.6	976.7	984.9	993.1	997.2	1001	1006	1014	1018	
2	38.51	39.00	39.17	39.25	39.30	39.33	39.36	39.37	39.39	39.41	39.43	39.45	39.46	39.47	39.48	39.49	39.49	39.50	
3	17.34	16.04	15.44	15.10	14.88	14.73	14.62	14.54	14.47	14.42	14.34	14.25	14.17	14.12	14.08	14.04	13.99	13.95	13.90
4	12.22	10.65	9.98	9.60	9.36	9.20	9.07	8.98	8.90	8.76	8.66	8.56	8.51	8.46	8.41	8.36	8.31	8.26	

$n \backslash m$	1	2	3	4	6	7	8	9	10	12	15	18	20	24	30	40	60	120	$\infty$
30	6.57	4.18	3.59	3.25	3.03	2.87	2.75	2.65	2.57	2.51	2.41	2.31	2.20	2.14	2.07	2.01	1.94	1.87	1.70
40	5.42	4.05	3.46	3.13	2.90	2.74	2.62	2.53	2.45	2.39	2.29	2.18	2.07	2.01	1.94	1.88	1.80	1.72	1.64
60	6.29	3.93	3.34	3.01	2.79	2.63	2.51	2.41	2.33	2.27	2.17	2.06	1.94	1.88	1.82	1.74	1.67	1.58	1.48
120	5.15	3.80	3.23	2.89	2.67	2.52	2.39	2.30	2.22	2.16	2.05	1.94	1.82	1.76	1.69	1.61	1.53	1.43	1.31
$\infty$	5.02	3.69	3.12	2.75	2.57	2.41	2.29	2.19	2.11	2.05	1.94	1.83	1.71	1.64	1.57	1.48	1.39	1.27	1.00

## VALUES OF F .05

## 2.6.23305

Row headings indicate degrees of freedom for the denominator and range from 1 through 30 at intervals of 1, then 40, 60, 120,  $\infty$ ; column headings indicate degrees of freedom for the numerator and have values from 1 through 10 at intervals of 1, then 12, 15, 20, 24, 30, 40, 60, 120,  $\infty$ ; for the most part, entries are tabulated to two decimal places; 12 pages.

$n \backslash m$	1	2	3	4	6	7	8	9	10	12	15	18	20	24	30	40	60	120	$\infty$
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5	241.9	243.9	245.9	248.0	249.1	250.1	251.1	252.2	253.3	254.3
2	18.61	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.43	19.45	19.46	19.47	19.48	19.49	19.50	
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55	8.53
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63

$n \backslash m$	1	2	3	4	6	7	8	9	10	12	15	18	20	24	30	40	60	120	$\infty$
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.62
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.51
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99	1.92	1.84	1.76	1.70	1.65	1.59	1.53	1.47	1.39
120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96	1.91	1.83	1.75	1.66	1.61	1.55	1.50	1.43	1.35	1.26
$\infty$	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83	1.76	1.67	1.57	1.52	1.46	1.39	1.32	1.22	1.00

VALUES OF F : 10

2.6.23310

Row headings indicate degrees of freedom for the denominator and range from 1 through 30 at intervals of 1, then 40, 60, 120,  $\infty$ ; column headings indicate degrees of freedom for the numerator and have values from 1 through 10 at intervals of 1, then 12, 15, 20, 24, 30, 40, 60, 120,  $\infty$ ; for the most part, entries are tabulated to two decimal places; 12 pages.

$\frac{m}{n}$	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	-
1	39.86	49.50	63.59	65.83	67.24	68.20	68.91	59.44	59.86	60.19	60.71	61.22	61.74	62.00	62.26	62.63	62.79	63.33	
2	8.53	9.00	9.16	9.24	9.33	9.29	9.38	9.37	9.38	9.39	9.41	9.42	9.44	9.45	9.46	9.47	9.48	9.49	
3	5.34	5.46	5.39	5.24	5.31	5.28	5.27	5.25	5.24	5.23	5.22	5.20	5.18	5.18	5.17	5.16	5.15	5.14	5.13
4	4.64	4.32	4.19	4.11	4.05	4.01	3.98	3.95	3.94	3.92	3.90	3.87	3.84	3.83	3.80	3.79	3.78	3.75	

30	2.88	2.49	2.28	2.14	2.05	1.98	1.93	1.88	1.85	1.82	1.77	1.72	1.67	1.61	1.57	1.61	1.54	1.50	1.46
40	2.84	2.44	2.23	2.09	2.00	1.93	1.87	1.83	1.79	1.76	1.71	1.66	1.61	1.57	1.54	1.51	1.47	1.42	1.38
60	2.79	2.39	2.18	2.04	1.95	1.87	1.82	1.77	1.74	1.71	1.66	1.60	1.54	1.51	1.48	1.44	1.40	1.35	1.29
120	2.75	2.35	2.13	2.00	1.99	1.90	1.82	1.77	1.72	1.68	1.65	1.60	1.55	1.48	1.45	1.41	1.37	1.32	1.26
∞	2.71	2.30	2.08	1.94	1.94	1.85	1.77	1.72	1.67	1.63	1.60	1.55	1.49	1.42	1.38	1.34	1.30	1.24	1.17

VALUES OF F .25

2.6.23325

Row headings indicate degrees of freedom for the denominator and range from 1 through 30 at intervals of 1, then 40, 60, 120,  $\infty$ ; column headings indicate degrees of freedom for the numerator and have values from 1 through 10 at intervals of 1, then 12, 15, 20, 24, 30, 40, 60, 120,  $\infty$ ; for the most part, entries are tabulated to two decimal places; 12 pages.

30	1.36	1.45	1.44	1.42	1.41	1.39	1.37	1.36	1.35	1.34	1.33	1.32	1.31	1.30	1.29	1.28	1.27	1.26	1.25	1.24	1.23	1.22	1.21	1.20	1.19	1.18	1.17	1.16	1.15	1.14	1.13	1.12	1.11	1.10	1.09	1.08	1.07	1.06	1.05	1.04	1.03	1.02	1.01	1.00
40	1.30	1.44	1.42	1.40	1.36	1.37	1.35	1.34	1.33	1.32	1.31	1.30	1.29	1.28	1.27	1.26	1.25	1.24	1.23	1.22	1.21	1.20	1.19	1.18	1.17	1.16	1.15	1.14	1.13	1.12	1.11	1.10	1.09	1.08	1.07	1.06	1.05	1.04	1.03	1.02	1.01	1.00		
50	1.25	1.42	1.41	1.40	1.37	1.38	1.36	1.35	1.34	1.33	1.32	1.31	1.30	1.29	1.28	1.27	1.26	1.25	1.24	1.23	1.22	1.21	1.20	1.19	1.18	1.17	1.16	1.15	1.14	1.13	1.12	1.11	1.10	1.09	1.08	1.07	1.06	1.05	1.04	1.03	1.02	1.01	1.00	
60	1.20	1.34	1.40	1.37	1.36	1.37	1.35	1.34	1.33	1.32	1.31	1.30	1.29	1.28	1.27	1.26	1.25	1.24	1.23	1.22	1.21	1.20	1.19	1.18	1.17	1.16	1.15	1.14	1.13	1.12	1.11	1.10	1.09	1.08	1.07	1.06	1.05	1.04	1.03	1.02	1.01	1.00		
70	1.15	1.32	1.36	1.35	1.34	1.33	1.32	1.31	1.30	1.29	1.28	1.27	1.26	1.25	1.24	1.23	1.22	1.21	1.20	1.19	1.18	1.17	1.16	1.15	1.14	1.13	1.12	1.11	1.10	1.09	1.08	1.07	1.06	1.05	1.04	1.03	1.02	1.01	1.00					
80	1.10	1.28	1.33	1.32	1.31	1.30	1.29	1.28	1.27	1.26	1.25	1.24	1.23	1.22	1.21	1.20	1.19	1.18	1.17	1.16	1.15	1.14	1.13	1.12	1.11	1.10	1.09	1.08	1.07	1.06	1.05	1.04	1.03	1.02	1.01	1.00								
90	1.05	1.24	1.29	1.28	1.27	1.26	1.25	1.24	1.23	1.22	1.21	1.20	1.19	1.18	1.17	1.16	1.15	1.14	1.13	1.12	1.11	1.10	1.09	1.08	1.07	1.06	1.05	1.04	1.03	1.02	1.01	1.00												
100	1.00	1.20	1.25	1.24	1.23	1.22	1.21	1.20	1.19	1.18	1.17	1.16	1.15	1.14	1.13	1.12	1.11	1.10	1.09	1.08	1.07	1.06	1.05	1.04	1.03	1.02	1.01	1.00																
110	0.95	1.16	1.21	1.20	1.19	1.18	1.17	1.16	1.15	1.14	1.13	1.12	1.11	1.10	1.09	1.08	1.07	1.06	1.05	1.04	1.03	1.02	1.01	1.00																				
120	0.90	1.12	1.17	1.16	1.15	1.14	1.13	1.12	1.11	1.10	1.09	1.08	1.07	1.06	1.05	1.04	1.03	1.02	1.01	1.00																								
130	0.85	1.08	1.13	1.12	1.11	1.10	1.09	1.08	1.07	1.06	1.05	1.04	1.03	1.0																														

F VALUES FOR  $\alpha = .01$ 

## 2.6.25501

Column headings are: df (denominator), df (numerator); subheadings for numerator columns range from 1 through 16 at intervals of 1, then 18, 20, 24, 30, 40, 50, 60, 80, 120, infinity; row headings under df (denominator) start with 15 through 30 at intervals of 1, from 30 through 50 at intervals of 2, from 50 through 70 at intervals of 5, from 70 through 100 at intervals of 10, followed by 120, 150, 200, 300, 400, 1000, infinity; entries are tabulated to two decimal places; 15 pages.

df den.	df num..												
	1	2	3	4	5	6	7	8	9	10	11	12	13
15	8.68	6.36	5.42	4.89	4.56	4.32	4.14	4.00	3.89	3.80	3.73	3.67	3.61
16	8.53	6.23	5.29	4.77	4.44	4.20	4.03	3.89	3.78	3.69	3.62	3.55	3.50
17	8.40	6.11	5.18	4.67	4.34	4.10	3.93	3.79	3.68	3.59	3.52	3.46	3.40
18	8.29	6.01	5.09	4.58	4.25	4.01	3.84	3.71	3.60	3.51	3.43	3.37	3.32
19	8.18	5.93	5.01	4.50	4.17	3.94	3.77	3.63	3.52	3.43	3.36	3.30	3.24
48	7.20	5.08	4.22	3.74	3.43	3.20	3.04	2.91	2.80	2.72	2.64	2.58	2.53
50	7.17	5.06	4.20	3.72	3.41	3.19	3.02	2.89	2.79	2.70	2.63	2.56	2.51
55	7.12	5.01	4.16	3.68	3.37	3.15	2.98	2.85	2.75	2.66	2.59	2.53	2.47
60	7.08	4.98	4.13	3.65	3.34	3.12	2.95	2.82	2.72	2.63	2.56	2.50	2.44
65	7.04	4.95	4.10	3.62	3.31	3.09	2.93	2.80	2.69	2.61	2.53	2.47	2.42
70	6.98	4.92	4.08	3.60	3.29	3.07	2.91	2.78	2.67	2.59	2.51	2.45	2.40
80	6.96	4.88	4.04	3.56	3.26	3.04	2.87	2.74	2.64	2.55	2.48	2.42	2.36
200	6.76	4.71	3.88	3.42	3.11	2.89	2.73	2.60	2.50	2.41	2.34	2.28	2.22
300	6.72	4.68	3.85	3.38	3.08	2.86	2.70	2.57	2.47	2.38	2.31	2.25	2.19
400	6.70	4.66	3.83	3.37	3.06	2.85	2.69	2.56	2.45	2.37	2.29	2.23	2.17
1000	6.66	4.63	3.80	3.34	3.04	2.82	2.66	2.53	2.43	2.34	2.26	2.20	2.15
$\infty$	6.63	4.61	3.78	3.32	3.02	2.80	2.64	2.51	2.41	2.32	2.25	2.18	2.13

	14	15	16	18	20	24	30	40	50	60	80	120	$\infty$
15	3.56	3.52	3.48	3.42	3.37	3.29	3.21	3.13	3.08	3.05	3.00	2.96	2.87
16	3.45	3.41	3.37	3.31	3.26	3.18	3.10	3.02	2.97	2.93	2.84	2.84	2.75
17	3.35	3.31	3.27	3.21	3.16	3.08	3.00	2.92	2.87	2.83	2.79	2.75	2.65
18	3.27	3.23	3.19	3.13	3.08	3.00	2.92	2.84	2.78	2.75	2.70	2.66	2.57
19	3.19	3.15	3.12	3.05	3.00	2.92	2.84	2.76	2.71	2.67	2.63	2.58	2.49
48	2.48	2.44	2.40	2.33	2.28	2.20	2.12	2.03	1.97	1.93	1.87	1.82	1.70
50	2.46	2.42	2.38	2.32	2.27	2.18	2.10	2.01	1.95	1.91	1.86	1.80	1.68
55	2.42	2.38	2.34	2.28	2.23	2.15	2.06	1.97	1.91	1.87	1.82	1.76	1.64
60	2.39	2.35	2.31	2.25	2.20	2.12	2.03	1.94	1.88	1.84	1.78	1.73	1.60
65	2.37	2.33	2.29	2.22	2.17	2.09	2.00	1.91	1.85	1.81	1.75	1.70	1.57
70	2.35	2.31	2.27	2.20	2.15	2.07	1.98	1.89	1.83	1.78	1.73	1.67	1.54
80	2.31	2.27	2.23	2.17	2.12	2.03	1.94	1.85	1.79	1.75	1.69	1.63	1.49
200	2.17	2.13	2.09	2.02	1.97	1.89	1.79	1.69	1.63	1.58	1.52	1.45	1.28
300	2.14	2.10	2.06	1.99	1.94	1.85	1.76	1.66	1.59	1.55	1.48	1.41	1.22
400	2.13	2.08	2.04	1.98	1.93	1.84	1.75	1.64	1.57	1.53	1.46	1.39	1.19
1000	2.10	2.06	2.02	1.95	1.90	1.81	1.72	1.61	1.54	1.49	1.42	1.35	1.11
$\infty$	2.08	2.04	2.00	1.93	1.88	1.79	1.70	1.59	1.52	1.47	1.40	1.32	1.00

<sup>a</sup>This table is partly abridged from Table 4.1 in Owen (1962), and partly computed by linear interpolations in reciprocals of  $df$ . Reproduced with the permission of the publishers.  
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F VALUES FOR  $\alpha = .05$ 

## 2.6.25505

Column headings are: df (denominator), df (numerator); subheadings for numerator columns range from 1 through 16 at intervals of 1, then 18, 20, 24, 30, 40, 50, 60, 80, 120, infinity; row headings under df denominator start with 15 through 30 at intervals of 1, from 30 through 50 at intervals of 2, from 50 through 70 at intervals of 5, from 70 through 100 at intervals of 10, followed by 120, 150, 200, 300, 400, 1000, infinity; entries are tabulated to two decimal places; 15 pages..

		df <sub>num.</sub>												
df <sub>den.</sub>		1	2	3	4	5	6	7	8	9	10	11	12	13
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.51	2.48	2.45	
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.46	2.42	2.40	
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.41	2.38	2.35	
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.37	2.34	2.31	
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.34	2.31	2.28	
48	4.04	3.19	2.80	2.57	2.41	2.30	2.21	2.14	2.08	2.03	1.99	1.96	1.93	
50	4.03	3.18	2.79	2.56	2.40	2.29	2.20	2.13	2.07	2.03	1.99	1.95	1.92	
55	4.02	3.17	2.77	2.54	2.38	2.27	2.18	2.11	2.06	2.01	1.97	1.93	1.90	
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99	1.95	1.92	1.89	
65	3.99	3.14	2.75	2.51	2.36	2.24	2.15	2.08	2.03	1.98	1.94	1.90	1.87	
70	3.98	3.13	2.74	2.50	2.35	2.23	2.14	2.07	2.02	1.97	1.93	1.89	1.86	
80	3.96	3.11	2.72	2.49	2.33	2.21	2.13	2.06	2.00	1.95	1.91	1.88	1.84	
200	3.89	3.04	2.65	2.42	2.26	2.14	2.06	1.99	1.93	1.88	1.84	1.80	1.77	
300	3.87	3.03	2.64	2.40	2.24	2.13	2.04	1.97	1.91	1.86	1.82	1.79	1.75	
400	3.86	3.02	2.63	2.39	2.23	2.12	2.03	1.96	1.90	1.85	1.81	1.78	1.74	
1000	3.85	3.00	2.61	2.38	2.22	2.11	2.02	1.95	1.89	1.84	1.80	1.76	1.73	
$\infty$	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83	1.79	1.75	1.72	
	14	15	16	18	20	24	30	40	50	60	80	120	$\infty$	
15	2.42	2.40	2.38	2.35	2.33	2.29	2.25	2.20	2.18	2.16	2.14	2.11	2.07	
16	2.37	2.35	2.33	2.30	2.28	2.24	2.19	2.15	2.12	2.11	2.08	2.06	2.01	
17	2.33	2.31	2.29	2.26	2.23	2.19	2.15	2.10	2.08	2.06	2.03	2.01	1.96	
18	2.29	2.27	2.25	2.22	2.19	2.15	2.11	2.06	2.04	2.02	1.99	1.97	1.92	
19	2.26	2.23	2.21	2.18	2.16	2.11	2.07	2.03	2.00	1.98	1.95	1.93	1.88	
48	1.90	1.88	1.86	1.82	1.79	1.75	1.70	1.64	1.61	1.59	1.55	1.52	1.45	
50	1.89	1.87	1.85	1.81	1.78	1.74	1.69	1.63	1.60	1.58	1.54	1.51	1.44	
55	1.88	1.85	1.83	1.79	1.76	1.72	1.67	1.61	1.58	1.55	1.52	1.49	1.41	
60	1.86	1.84	1.81	1.78	1.75	1.70	1.65	1.59	1.56	1.53	1.50	1.47	1.39	
65	1.85	1.82	1.80	1.76	1.73	1.69	1.63	1.58	1.54	1.52	1.48	1.45	1.37	
70	1.84	1.81	1.79	1.75	1.72	1.67	1.62	1.56	1.53	1.50	1.47	1.44	1.35	
80	1.82	1.79	1.77	1.73	1.70	1.65	1.60	1.54	1.51	1.48	1.45	1.41	1.32	
200	1.74	1.72	1.69	1.65	1.62	1.57	1.52	1.45	1.41	1.38	1.34	1.30	1.19	
300	1.73	1.70	1.68	1.64	1.61	1.55	1.50	1.43	1.39	1.36	1.32	1.27	1.15	
400	1.72	1.69	1.67	1.63	1.60	1.54	1.49	1.42	1.38	1.35	1.31	1.26	1.13	
1000	1.70	1.68	1.65	1.61	1.58	1.53	1.47	1.41	1.36	1.33	1.28	1.24	1.08	
$\infty$	1.69	1.67	1.64	1.60	1.57	1.52	1.46	1.39	1.35	1.32	1.27	1.22	1.00	

<sup>a</sup>This table is partly abridged from Table 4.1 in Owen (1962), and partly computed by linear interpolation in reciprocals of df. Reproduced with the permission of the publishers. (Courtesy of the U.S. Atomic Energy Commission.)

Row headings indicate degrees of freedom for the denominator and range from 1 through 30 at intervals of 2, from 50 through 70 at intervals of 5, then 80, 100, 125, 150, 200, 400, 1000,  $\infty$ ; column headings indicate degrees of freedom for the numerator and have values from 1 through 12 at intervals of 1, then 14, 16, 20, 24, 30, 40, 50, 75, 100, 200, 500,  $\infty$ ; for the most part, entries (in bold-face type, the lower of the double listings) are tabulated to two decimal places; 20 pages.

Degrees of freedom for greater mean square (numerator)												
	1	2	3	4	5	6	7	8	9	10	11	12
1	1.61	2.00	2.16	2.25	2.30	2.34	2.37	2.39	2.41	2.42	2.43	2.44
4.052	4.999	5.403	5.625	5.764	5.859	5.928	5.981	6.022	6.056	6.082	6.106	6.122
2	18.51	19.00	19.16	19.25	19.30	19.33	19.36	19.37	19.38	19.39	19.40	19.41
98.49	99.00	99.17	99.23	99.30	99.33	99.36	99.37	99.39	99.40	99.41	99.42	99.43
3	10.13	9.55	9.28	9.12	9.01	8.94	8.88	8.84	8.81	8.78	8.76	8.74
34.12	30.52	29.46	28.71	28.24	27.91	27.67	27.49	27.34	27.13	27.05	26.92	26.81
4	7.71	6.94	6.59	6.38	6.16	6.09	6.04	6.00	5.95	5.93	5.91	5.87
21.20	18.00	16.69	15.98	15.52	15.21	14.98	14.80	14.66	14.54	14.45	14.37	14.24
5	6.61	5.79	5.41	5.19	5.05	4.95	4.86	4.82	4.78	4.74	4.70	4.68
16.24	13.27	12.06	11.39	10.97	10.67	10.45	10.29	10.15	10.05	9.96	9.89	9.77
1 square [denominator]												
30	4.17	3.32	2.92	2.69	2.53	2.42	2.34	2.27	2.21	2.16	2.12	2.09
7.56	5.39	4.91	4.02	3.70	3.47	3.30	3.17	3.06	2.98	2.90	2.84	2.74
32	4.15	3.30	2.90	2.67	2.51	2.40	2.32	2.25	2.19	2.14	2.10	2.07
7.50	5.34	4.46	3.97	3.42	3.25	3.12	3.01	2.94	2.86	2.80	2.70	2.62
34	4.13	3.23	2.88	2.65	2.49	2.38	2.30	2.23	2.17	2.12	2.08	2.05
7.44	5.29	4.43	3.93	3.61	3.29	3.21	3.08	2.97	2.89	2.82	2.76	2.66
Mean square [denominator]												
50	4.03	3.18	2.79	2.56	2.40	2.29	2.20	2.13	2.07	2.02	1.99	1.93
7.17	5.06	4.20	3.72	3.41	3.18	3.02	2.88	2.78	2.70	2.62	2.56	2.46
55	4.02	3.17	2.78	2.54	2.38	2.27	2.18	2.11	2.05	2.00	1.93	1.88
7.12	5.01	4.16	3.68	3.37	3.15	2.98	2.85	2.75	2.66	2.59	2.53	2.43
60	4.00	3.15	2.76	2.52	2.37	2.25	2.17	2.10	2.04	1.99	1.92	1.86
7.08	4.98	4.13	3.63	3.34	3.12	2.95	2.82	2.72	2.63	2.56	2.50	2.40
Sum of squares [denominator]												
150	1.91	1.06	2.67	2.43	2.27	2.16	2.07	2.00	1.94	1.89	1.85	1.82
6.81	4.75	3.91	3.44	3.14	2.92	2.76	2.62	2.53	2.44	2.37	2.30	2.20
200	1.89	1.04	2.65	2.41	2.26	2.14	2.05	1.98	1.92	1.87	1.83	1.80
6.76	4.71	3.88	3.41	3.11	2.90	2.73	2.60	2.50	2.41	2.34	2.28	2.17
400	1.86	1.02	2.62	2.39	2.23	2.12	2.03	1.96	1.90	1.85	1.81	1.76
6.70	4.66	3.83	3.36	3.06	2.85	2.69	2.55	2.46	2.37	2.29	2.23	2.12
1000	1.85	1.00	2.61	2.38	2.22	2.10	2.02	1.95	1.89	1.84	1.80	1.76
6.66	4.62	3.80	3.34	3.04	2.82	2.66	2.53	2.43	2.34	2.26	2.20	2.09
∞	3.84	2.99	2.60	2.37	2.21	2.09	2.01	1.94	1.88	1.83	1.79	1.75
6.64	4.60	3.78	3.32	3.02	2.80	2.64	2.51	2.41	2.32	2.24	2.18	2.07

SOURCE: Table G is reproduced from G. W. Snedecor, *Statistical Methods*, 8th ed., Iowa State University Press, Ames, Iowa, by permission of the author and publisher.

## VALUES OF F .05

## 2.6.26505

Row headings indicate degrees of freedom for the denominator and range from 1 through 30 at intervals of 1, from 30 through 50 at intervals of 2, from 50 through 70 at intervals of 5, then 80, 100, 125, 150, 200, 400, 1000, etc; column headings indicate degrees of freedom for the numerator and have values from 1 through 12 at intervals of 1, then 14, 16, 20, 24, 30, 40, 50, 75, 100, 200, 500, etc; for the most part, entries (in roman type, the upper of the double listings) are tabulated to two decimal places; 20 pages.

Degrees of freedom for greater mean square [numerator]																										
	1	2	3	4	5	6	7	8	9	10	11	12	14	20	24	30	40	50	75	100	200	500	∞			
1	161	200	216	225	230	234	237	239	241	242	243	244	245	246	248	249	250	251	252	253	254	254	1			
4.052	4.999	5.403	5.625	5.764	5.859	5.928	5.981	6.022	6.056	6.082	6.106	6.142	6.169	6.208	6.234	6.261	6.286	6.302	6.323	6.344	6.352	6.361	1			
2	18.51	19.00	19.16	19.25	19.30	19.33	19.36	19.37	19.38	19.39	19.40	19.41	19.42	19.43	19.44	19.45	19.46	19.47	19.48	19.49	19.50	19.50	2			
98.49	99.00	99.17	99.25	99.30	99.33	99.36	99.37	99.39	99.40	99.41	99.42	99.43	99.44	99.45	99.46	99.47	99.48	99.49	99.49	99.50	99.50	99.50	2			
3	10.13	9.55	9.28	9.12	9.01	8.94	8.88	8.84	8.81	8.78	8.76	8.74	8.71	8.69	8.66	8.64	8.62	8.60	8.58	8.57	8.56	8.54	8.53	3		
34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.49	27.34	27.23	27.13	27.05	26.92	26.83	26.69	26.60	26.50	26.41	26.35	26.27	26.23	26.18	26.14	26.12	3		
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.93	5.91	5.87	5.84	5.80	5.77	5.74	5.71	5.70	5.68	5.66	5.65	5.63	4		
21.20	18.00	16.69	15.98	15.52	15.21	14.98	14.80	14.66	14.54	14.45	14.37	14.32	14.15	14.02	13.93	13.83	13.74	13.69	13.61	13.57	13.52	13.48	13.46	4		
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.78	4.74	4.70	4.68	4.64	4.60	4.56	4.53	4.50	4.46	4.44	4.42	4.40	4.38	4.36	5		
16.26	13.27	12.06	11.59	10.97	10.67	10.45	10.29	10.15	10.05	9.96	9.89	9.77	9.68	9.55	9.47	9.36	9.29	9.24	9.17	9.13	9.07	9.04	9.02	5		
square [denominator]																										
30	4.17	3.32	2.92	2.69	2.53	2.42	2.34	2.27	2.21	2.16	2.12	2.09	2.04	1.99	1.93	1.89	1.84	1.79	1.72	1.69	1.66	1.64	1.62	30		
7.54	5.39	4.51	4.02	3.70	3.47	3.30	3.17	3.06	2.98	2.90	2.84	2.74	2.66	2.59	2.51	2.47	2.38	2.39	2.34	2.16	2.13	2.07	2.03	2.01	30	
32	4.15	3.30	2.90	2.67	2.51	2.40	2.32	2.25	2.19	2.14	2.10	2.07	2.02	1.97	1.91	1.86	1.82	1.76	1.74	1.69	1.67	1.64	1.61	1.59	32	
7.50	5.34	4.46	3.97	3.66	3.46	3.25	3.12	3.01	2.94	2.86	2.80	2.70	2.62	2.51	2.42	2.34	2.25	2.20	2.12	2.08	2.02	1.96	1.94	1.92	32	
34	4.13	3.28	2.68	2.65	2.65	2.49	2.38	2.30	2.23	2.17	2.12	2.08	2.05	2.00	1.95	1.89	1.84	1.80	1.74	1.71	1.67	1.64	1.61	1.57	34	
7.44	5.29	4.42	3.93	3.61	3.36	3.21	3.06	2.97	2.89	2.82	2.76	2.66	2.59	2.51	2.47	2.38	2.30	2.21	2.15	2.08	2.04	1.96	1.94	1.91	34	
mean square																										
50	4.03	3.18	2.79	2.56	2.40	2.29	2.20	2.13	2.07	2.01	1.98	1.95	1.90	1.85	1.78	1.74	1.69	1.63	1.60	1.55	1.52	1.48	1.46	1.44	50	
7.17	5.06	4.20	3.72	3.41	3.18	3.02	2.88	2.78	2.70	2.62	2.56	2.46	2.39	2.26	2.18	2.10	2.00	1.94	1.86	1.82	1.76	1.71	1.68	1.66	1.64	50
55	4.02	3.17	2.78	2.54	2.38	2.27	2.18	2.11	2.05	1.97	1.93	1.88	1.83	1.76	1.72	1.67	1.61	1.58	1.52	1.48	1.46	1.43	1.41	1.39	55	
7.12	5.01	4.16	3.68	3.37	3.15	2.98	2.85	2.73	2.60	2.50	2.41	2.34	2.28	2.17	2.09	1.97	1.88	1.82	1.78	1.71	1.66	1.64	1.62	1.60	1.58	55
60	4.00	3.15	2.76	2.52	2.37	2.25	2.17	2.10	2.04	1.99	1.95	1.92	1.86	1.81	1.75	1.70	1.65	1.59	1.56	1.50	1.48	1.44	1.41	1.39	60	
degrees of freedom																										
150	3.91	3.06	2.67	2.43	2.27	2.16	2.07	2.00	1.94	1.89	1.85	1.82	1.76	1.71	1.64	1.59	1.54	1.47	1.44	1.37	1.34	1.32	1.29	1.25	1.22	150
6.81	4.75	3.91	3.44	3.14	2.92	2.76	2.62	2.53	2.44	2.37	2.30	2.20	2.12	2.00	1.91	1.83	1.72	1.66	1.56	1.51	1.43	1.37	1.33	1.30	1.28	150
200	3.89	3.04	2.65	2.41	2.26	2.14	2.05	1.98	1.92	1.87	1.83	1.80	1.74	1.69	1.62	1.57	1.52	1.45	1.42	1.35	1.32	1.28	1.25	1.22	1.19	200
6.76	4.71	3.88	3.41	3.11	2.90	2.73	2.60	2.50	2.41	2.34	2.24	2.17	2.09	1.97	1.88	1.79	1.69	1.62	1.53	1.48	1.43	1.39	1.35	1.32	1.28	200
400	3.86	3.02	2.62	2.39	2.23	2.12	2.03	1.96	1.90	1.85	1.81	1.78	1.72	1.67	1.60	1.54	1.49	1.42	1.38	1.32	1.28	1.22	1.16	1.13	400	
6.70	4.66	3.43	3.36	3.06	2.85	2.69	2.55	2.46	2.37	2.29	2.23	2.12	2.04	1.92	1.84	1.74	1.64	1.57	1.47	1.42	1.32	1.24	1.19	1.16	1.13	400
1000	3.85	3.00	2.61	2.38	2.22	2.10	2.02	1.95	1.89	1.84	1.80	1.76	1.70	1.65	1.58	1.53	1.47	1.41	1.36	1.30	1.26	1.19	1.13	1.08	1000	
6.64	4.60	3.78	3.32	3.02	2.80	2.64	2.51	2.41	2.32	2.24	2.16	2.07	1.99	1.91	1.87	1.79	1.69	1.59	1.51	1.46	1.38	1.30	1.28	1.19	1.11	60
∞	3.84	2.99	2.60	2.37	2.21	2.09	2.01	1.94	1.88	1.83	1.79	1.75	1.69	1.64	1.57	1.52	1.46	1.40	1.35	1.28	1.24	1.17	1.11	1.06	∞	

**CORRELATION****POWER OF SIGNIFICANCE TEST OF  $r$  AT  $\alpha = .01$  (TWO-TAILED)****2.7.1296001**

Column headings are:  $n$ , Population  $r$ ; under  $n$ , row headings range from 15 through 40 at intervals of 1, from 40 through 60 at intervals of 2, from 60 through 100 at intervals of 4, from 100 through 200 at intervals of 20, from 200 through 400 at intervals of 50, then 500, 600, 700, 800, 1000; Population  $r$  column has subheadings: .10, .20, .30, .40, .50, .60, .70, .80, .90; entries are tabulated to two decimal places (though decimal points are omitted). Note pre-cedes table; 5 pages.

Power of Significance Test of $r$ at $\alpha = .01$ (Two Tailed)										
$n$	Population $r$									
	.10	.20	.30	.40	.50	.60	.70	.80	.90	
15	01	03	06	13	25	44	68	90	*	50
16	01	03	07	14	28	48	73	93		52
17	01	03	08	16	30	52	77	95		54
18	01	04	08	17	33	56	80	96		56
19	02	04	09	19	36	59	83	97		58
20	02	04	09	20	38	62	85	98		60
21	02	04	10	21	41	66	88	98		64
22	02	04	11	23	43	68	90	99		68
30	02	06	17	36	62	85	98			100
31	02	07	17	37	64	87	98			120
32	02	07	18	39	66	88	98			140
38	02	08	23	48	76	94	*			350
39	02	09	24	49	77	95				400
40	02	09	25	50	78	95				500
42	03	09	26	53	81	96				600
44	03	10	28	56	83	97				700
46	03	11	29	58	85	98				800
48	03	11	31	61	87	98				1000

*Note:* Decimal points omitted in power values.

\*Power values at and below this point exceed .995.

<sup>a</sup>Slightly abridged from Table 3.3.4 in Cohen (1969). Reproduced with the permission of the publisher.

POWER OF SIGNIFICANCE TEST OF  $r$  AT  $\alpha = .05$  (TWO-TAILED)

## 2.7.1296005

Column headings are: n, Population r; under n, row headings range from 15 through 40 at intervals of 1, from 40 through 60 at intervals of 2, from 60 through 100 at intervals of 4, from 100 through 200 at intervals of 20, from 200 through 400 at intervals of 50, then 500, 600, 700, 800, 1000; Population r column has subheadings: .10, .20, .30, .40, .50, .60, .70, .80, .90; entries are tabulated to two decimal places (though decimal points are omitted). Note precedes table; 5 pages.

Power of Significance Test of $r$ at $\alpha = .05$ (Two Tailed)																			
n	Population r									n	Population r								
	.10	.20	.30	.40	.50	.60	.70	.80	.90		.10	.20	.30	.40	.50	.60	.70	.80	.90
15	06	11	19	32	50	70	88	98	*	50	11	29	57	83	97	*	*	*	*
16	07	11	21	35	53	73	90	98		52	11	30	59	85	97				
17	07	12	22	37	56	76	92	99		54	11	31	61	86	98				
18	07	12	23	39	59	79	94	99		56	11	32	62	87	98				
19	07	13	24	41	62	81	95	99		58	12	33	64	89	98				
20	07	14	25	43	64	83	96	*		60	12	34	65	90	99				
21	07	14	27	45	66	85	96			64	12	36	68	91	99				
30	08	19	37	61	83	95	*			100	17	52	86	99					
31	08	19	38	62	84	96				120	19	59	92	*					
32	08	20	39	64	85	97				140	22	66	95						
38	09	23	46	72	91	99				350	46	97							
39	09	23	47	73	91	99				400	52	98							
40	09	24	48	74	92	99				500	61	99							
42	10	25	50	76	93	99				600	69	*							
44	10	26	52	78	94	99				700	76								
46	10	27	54	80	95	*				800	81								
48	10	28	55	82	96					1000	89								

Note: Decimal points omitted in power values.

\*Power values at and below this point exceed .995.

VALUES OF RHO (RANK-ORDER CORRELATION COEFFICIENT)  
AT THE 5% AND 1% LEVELS OF SIGNIFICANCE

2.7.130216

Column headings are: N, .05, .01; row headings under N range from 5 through 10 at intervals of 1, from 10 through 30 at intervals of 2; entries are tabulated to three decimal places; note precedes table; 2 pages.

N	5%	1%
5	1.000	.....
6	.886	1.000
7	.786	.929
8	.738	.881
9	.683	.833

18	.475	.625
20	.450	.591
22	.428	.562
24	.409	.537
26	.392	.515
28	.377	.496
30	.364	.478

CRITICAL LEVELS OF r AT 5% AND 1% LEVELS OF SIGNIFICANCE

2.7.130246

Column headings are: df, .05, .01; row headings under degrees of freedom range from 1 through 30 at intervals of 1, from 30 through 50 at intervals of 5, from 50 through 100 at intervals of 10, from 100 through 150 at intervals of 25, then 200, 300, 400, 500, 1000; entries are tabulated to three decimal places; 2 pages.

df.	r <sub>.05</sub>	r <sub>.01</sub>
1	0.997	1.000
2	0.950	0.990
3	0.878	0.959
4	0.811	0.917
5	0.754	0.874
30	0.349	0.449
35	0.325	0.418
40	0.304	0.393
45	0.283	0.372
50	0.273	0.354
60	0.250	0.325
150	0.159	0.208
200	0.138	0.181
300	0.113	0.148
400	0.098	0.128
500	0.088	0.115
1000	0.062	0.081

VALUES OF THE CORRELATION COEFFICIENT REQUIRED  
FOR DIFFERENT LEVELS OF SIGNIFICANCE

2.7.13857

Column headings are: df, Levels of significance; row headings under df range from 1 through 30 at intervals of 1, from 30 through 50 at intervals of 2, from 50 through 100 at intervals of 5, then 120, 150, 200, 300, 400, 500, 1000; levels of significance for a one-tailed test are: .05, .025, .01, .005, and for a two-tailed test: .10, .05, .02, .01; entries are tabulated to three decimal places; 4 pages.

Levels of significance for a one-tailed test

df	.05	.025	.01	.005
	Levels of significance for a two-tailed test			
	.10	.05	.02	.01
1	.988	.997	.9995	.9999
2	.900	.950	.980	.990
3	.805	.878	.934	.959
4	.729	.811	.882	.917
5	.669	.754	.833	.874
46	.240	.285	.335	.368
48	.235	.279	.328	.361
50	.231	.273	.322	.354
55	.220	.261	.307	.339
60	.211	.250	.295	.325
150	.134	.159	.189	.208
200	.116	.138	.164	.181
300	.095	.113	.134	.148
400	.082	.098	.116	.128
500	.073	.088	.104	.115
1000	.052	.062	.073	.081

\*Table E is taken from Table V.A of Fisher: *Statistical Methods for Research Workers*, published by Oliver & Boyd Limited, Edinburgh, and by permission of the author and publishers. Supplementary values were calculated at San Jose State College by K. Fernandes.

VALUES OF  $r$  FOR DIFFERENT LEVELS OF SIGNIFICANCE

## 2.7.140531

Degrees of freedom serve as row headings and range from 1 through 20 at intervals of 1, from 20 through 50 at intervals of 5, from 50 through 100 at intervals of 10; levels of significance are: .1, .05, .02, .01, .001; entries are tabulated to four decimal places for the most part; 2 pages.

<i>df</i>	.1	.05	.02	.01	.001
1	.98769	.99692	.999507	.999877	.9999988
2	.90000	.95000	.98000	.990000	.99900
3	.8054	.8783	.93433	.95873	.99116
4	.7293	.8114	.8822	.91720	.97406
5	.6694	.7543	.8329	.8743	.95074
40	.2573	.3044	.3578	.3932	.4896
45	.2428	.2875	.3384	.3721	.4648
50	.2306	.2732	.3218	.3541	.4433
60	.2108	.2500	.2948	.3248	.4078
70	.1954	.2319	.2737	.3017	.3799
80	.1829	.2172	.2565	.2830	.3568
90	.1726	.2050	.2422	.2673	.3375
100	.1638	.1946	.2301	.2540	.3211

$$\text{Values of } w = \frac{1}{2} \log \frac{1+r}{1-r}$$

## 2.7.234

Values of  $r$  range from .00 through .99 at intervals of .01; values of  $w$  are tabulated to three decimal places; 3 pages.

<i>r</i>	<i>w</i>	<i>r</i>	<i>w</i>	<i>r</i>	<i>w</i>	<i>r</i>	<i>w</i>
.00	.000	.25	.255	.50	.549	.75	.973
.01	.010	.26	.266	.51	.563	.76	.996
.02	.020	.27	.277	.52	.576	.77	1.020
.03	.030	.28	.288	.53	.590	.78	1.045
.04	.040	.29	.299	.54	.604	.79	1.071
.05	.050	.30	.310	.55	.618	.80	1.099
.20	.203	.45	.485	.70	.867	.95	1.832
.21	.213	.46	.497	.71	.887	.96	1.946
.22	.224	.47	.510	.72	.908	.97	2.092
.23	.234	.48	.523	.73	.929	.98	2.298
.24	.245	.49	.536	.74	.950	.99	2.647

$$\text{VALUES OF } Z = \frac{1}{2} \log \left( \frac{1+r}{1-r} \right)$$

## 2.7.234F

Values of  $r$  are tabulated from .00 through .99 at intervals of .01; the first decimal digit of  $r$  is a row heading while the second decimal digit of  $r$  is contained in a column heading; the value of  $r$  is obtained by the addition of a row heading and a column heading; entries are tabulated to three decimal places; 2 pages.

$r$	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	0.000	0.010	0.020	0.030	0.040	0.050	0.060	0.070	0.080	0.090
0.1	0.100	0.110	0.121	0.131	0.141	0.151	0.161	0.172	0.182	0.192
0.2	0.203	0.213	0.224	0.234	0.245	0.255	0.266	0.277	0.288	0.299
0.3	0.310	0.321	0.332	0.343	0.354	0.365	0.377	0.388	0.400	0.412
0.4	0.424	0.436	0.448	0.460	0.472	0.485	0.497	0.510	0.523	0.536

0.8	1.099	1.127	1.157	1.188	1.221	1.256	1.293	1.333	1.376	1.422
0.9	1.472	1.528	1.589	1.658	1.738	1.832	1.946	2.092	2.298	2.647

For negative values of  $r$  put a minus sign in front of the corresponding  $Z$ 's, and vice versa.

TRANSFORMATION OF  $r$  TO  $z_r$ 

## 2.7.235

Values of  $r$  are tabulated from .000 through .995 at intervals of .005; values of  $z$  are tabulated to three decimal places; 5 pages.

$r$	$z_r$	$r$	$z_r$	$r$	$z_r$	$r$	$z_r$	$r$	$z_r$
.000 .000	.200 .203	.400 .424	.600 .693	.800 1.099					
.005 .005	.205 .208	.405 .430	.605 .701	.805 1.113					
.010 .010	.210 .213	.410 .436	.610 .709	.810 1.127					
.015 .015	.215 .218	.415 .442	.615 .717	.815 1.142					
.020 .020	.220 .224	.420 .448	.620 .725	.820 1.157					
.175 .177	.375 .394	.575 .655	.775 1.033	.975 2.185					
.180 .182	.380 .400	.580 .662	.780 1.045	.980 2.298					
.185 .187	.385 .406	.585 .670	.785 1.058	.985 2.443					
.190 .192	.390 .412	.590 .678	.790 1.071	.990 2.647					
.195 .198	.395 .418	.595 .685	.795 1.085	.995 2.994					

SOURCE: From *Statistical Methods* by Allen L. Edwards. Copyright 1954, © 1967 by Allen L. Edwards. Reprinted by permission of Holt, Rinehart & Winston, Inc.

**$z'$  TRANSFORMATION OF  $r$** **2.7.238**

Column headings are:  $r$ ,  $z'$ ; row headings under  $r$  range from .00 through .79 at intervals of .01, from .800 through .995 at intervals of .005; entries under  $z'$  are tabulated to three decimal places; 3 pages.

$r$	$z'$	$r$	$z'$	$r$	$z'$	$r$	$z'$
.00	.000	.30	.310	.60	.693	.850	1.256
.01	.010	.31	.321	.61	.709	.855	1.274
.02	.020	.32	.332	.62	.725	.860	1.293
.03	.030	.33	.343	.63	.741	.865	1.313
.04	.040	.34	.354	.64	.758	.870	1.333
<hr/>							
.25	.255	.55	.618	.825	1.172	.975	2.185
.26	.266	.56	.633	.830	1.188	.980	2.298
.27	.277	.57	.648	.835	1.204	.985	2.443
.28	.288	.58	.662	.840	1.221	.990	2.647
.29	.299	.59	.678	.845	1.238	.995	2.994

**TRANSFORMATION OF  $r$  TO  $z$** **2.7.246**

Values of  $r$  are listed from .000 through .998 at intervals of .002; the first two decimal digits of  $r$  are row headings while the third decimal digit of  $r$  is contained in the column heading; the value of  $r$  is obtained by addition of the row heading and the column heading; values are tabulated to four decimals; 7 pages.

$r$	$r$ (3rd decimal)					$r$	$r$ (3rd decimal)				
	.000	.002	.004	.006	.008		.000	.002	.004	.006	.008
.00	.0000	.0020	.0040	.0060	.0080	.35	.3654	.3677	.3700	.3723	.3746
1	.0100	.0120	.0140	.0160	.0180	6	.3769	.3792	.3815	.3838	.3861
2	.0200	.0220	.0240	.0260	.0280	7	.3884	.3907	.3931	.3954	.3977
3	.0300	.0320	.0340	.0360	.0380	8	.4001	.4024	.4047	.4071	.4094
4	.0400	.0420	.0440	.0460	.0480	9	.4118	.4142	.4165	.4189	.4213
<hr/>											
.80	1.099	1.104	1.110	1.116	1.121	.95	1.832	1.853	1.874	1.897	1.921
1	1.127	1.133	1.139	1.145	1.151	6	1.946	1.972	2.000	2.029	2.060
2	1.157	1.163	1.169	1.175	1.182	7	2.092	2.127	2.165	2.205	2.249
3	1.188	1.195	1.201	1.208	1.214	8	2.298	2.351	2.410	2.477	2.555
4	1.221	1.228	1.235	1.242	1.249	9	2.647	2.759	2.903	3.106	3.453

## TRANSFORMATION OF r TO Z

2.7.247

Values of r range from .000 through .999 at intervals of .001; the first two decimal digits of r are row headings while the third decimal digit of r is contained in the column heading; the value of r is obtained by addition of the row heading and the column heading; entries are tabulated to four decimal places; 14 pages.

r	.000	.001	.002	.003	.004	.005	.006	.007	.008	.009
.00	.0000	.0010	.0020	.0030	.0040	.0050	.0060	.0070	.0080	.0090
.01	.0100	.0110	.0120	.0130	.0140	.0150	.0160	.0170	.0180	.0190
.02	.0200	.0210	.0220	.0230	.0240	.0250	.0260	.0270	.0280	.0290
.03	.0300	.0310	.0320	.0330	.0340	.0350	.0360	.0370	.0380	.0390
.04	.0400	.0410	.0420	.0430	.0440	.0450	.0460	.0470	.0480	.0490
.05	.0500	.0510	.0520	.0530	.0541	.0551	.0561	.0571	.0581	.0591
.06	.0601	.0611	.0621	.0631	.0641	.0651	.0661	.0671	.0681	.0691
.07	.0701	.0711	.0721	.0731	.0741	.0751	.0761	.0772	.0782	.0792
.08	.0802	.0812	.0822	.0832	.0842	.0852	.0862	.0872	.0882	.0892
.09	.0902	.0913	.0923	.0933	.0943	.0953	.0963	.0973	.0983	.0993

.90	1.4722	1.4775	1.4828	1.4882	1.4937	1.4992	1.5047	1.5103	1.5160	1.5217
.91	1.5275	1.5334	1.5393	1.5453	1.5513	1.5574	1.5636	1.5698	1.5762	1.5826
.92	1.5890	1.5956	1.6022	1.6089	1.6157	1.6226	1.6296	1.6366	1.6438	1.6510
.93	1.6584	1.6658	1.6734	1.6811	1.6888	1.6967	1.7047	1.7129	1.7211	1.7295
.94	1.7380	1.7467	1.7555	1.7645	1.7736	1.7828	1.7923	1.8019	1.8117	1.8216
.95	1.8318	1.8421	1.8527	1.8635	1.8745	1.8857	1.8972	1.9090	1.9210	1.9333
.96	1.9459	1.9588	1.9721	1.9857	1.9996	2.0140	2.0287	2.0439	2.0595	2.0756
.97	2.0923	2.1095	2.1273	2.1457	2.1649	2.1847	2.2054	2.2269	2.2494	2.2729
.98	2.2976	2.3235	2.3507	2.3796	2.4101	2.4427	2.4774	2.5147	2.5550	2.5982
.99	2.6467	2.6996	2.7587	2.8257	2.9031	2.9945	3.1063	3.2504	3.4534	3.8002

\* Table G is taken from Table Z of P.H. DuBois: *An Introduction to Psychological Statistics*. New York: Harper & Row, Publishers, Incorporated, 1965, with the permission of author and publisher.

## SPECIAL PURPOSE TESTS

PROBABILITIES ASSOCIATED WITH VALUES AS LARGE AS OBSERVED VALUES OF  $\chi^2$  IN THE FRIEDMAN TWO-WAY ANALYSIS OF VARIANCE BY RANKS  
( $k = 3$ ,  $k = 4$ )

## 2.8.F3

Column headings for  $k = 3$  are  $N = 2$ ,  $N = 3$ ,  $N = 4$ ,  $N = 5$ ,  $N = 6$ ,  $N = 7$ ,  $N = 8$ ,  $N = 9$ ; sub-column headings for each of these are:  $\chi^2$ ,  $p$ ; column headings for  $k = 4$  are:  $N = 2$ ,  $N = 3$ ,  $N = 4$ , sub-column headings being the same as for  $k = 3$ ; 8 pages.

SOURCE: M. Friedman, "The use of ranks to avoid the assumption of normality implicit in the analysis of variance," *J. Am. Statist. Assoc.*, 32, 688-689 (1937), with the kind permission of the author and publisher.

$k = 3$								
$N = 2$		$N = 3$		$N = 4$		$N = 5$		
$\chi^2$	$p$	$\chi^2$	$p$	$\chi^2$	$p$	$\chi^2$	$p$	
0	1.000	.000	1.000	.0	1.000	.0	1.000	
1	.833	.667	.944	.5	.931	.4	.954	
3	.500	2.000	.528	1.5	.653	1.2	.691	
4	.167	2.667	.361	2.0	.431	1.6	.522	
		4.667	.194	3.5	.273	2.8	.367	
		0.000	.028	4.5	.125	3.6	.182	
				6.0	.069	4.8	.124	
				6.5	.042	5.2	.093	
				8.0	.0046	6.4	.039	
						7.6	.024	
						8.4	.0085	
						10.0	.0007	
$N = 6$		$N = 7$		$N = 8$		$N = 9$		
$\chi^2$	$p$	$\chi^2$	$p$	$\chi^2$	$p$	$\chi^2$	$p$	
.00	1.000	.000	1.000	.00	1.000	.000	1.000	
.33	.956	.286	.964	.25	.967	.222	.971	
1.00	.740	.857	.768	.75	.794	.667	.814	
1.33	.570	1.143	.620	1.00	.654	.889	.865	
2.33	.430	2.000	.486	1.75	.531	1.556	.569	
10.33	.0017	8.857	.0084	7.75	.018	6.889	.031	
12.00	.00013	10.286	.0036	9.00	.0099	8.000	.019	
		10.571	.0027	9.25	.0080	8.222	.016	
		11.143	.0012	9.75	.0048	8.667	.010	
		12.286	.00032	10.75	.0024	9.556	.0060	
		14.000	.000021	12.00	.0011	10.667	.0035	
				12.25	.00086	10.889	.0029	
				13.00	.00026	11.556	.0013	
				16.00	.0000036	13.556	.00035	
						14.000	.00020	
						14.222	.000097	
						14.889	.000054	
						16.222	.000011	
						18.000	.000006	
$k = 4$								
$N = 2$		$N = 3$		$N = 4$				
$\chi^2$	$p$	$\chi^2$	$p$	$\chi^2$	$p$	$\chi^2$	$p$	
.0	1.000	.2	1.000	.0	1.000	5.7	.141	
.6	.958	.6	.958	.3	.992	6.0	.105	
1.2	.834	1.0	.910	.6	.928	6.3	.094	
1.8	.792	1.8	.727	.9	.900	6.6	.077	
2.4	.625	2.2	.608	1.2	.800	6.9	.068	
6.0	.042	5.4	.175	3.0	.432	8.7	.014	
		5.8	.148	3.3	.389	9.3	.012	
		8.2	.017	4.8	.200	10.8	.0016	
		9.0	.0017	5.1	.190	11.1	.00094	
				5.4	.158	12.0	.000072	

## CRITICAL VALUES OF D (OR C) IN THE FISHER-YATES TEST

## 2.8.FY1

There are three main headings in this table: Totals in Right Margin, B (or A), Level of significance; the last heading has subheadings of .05, .025, .01, .005; entries in the first column are shown in groups, each group having one equation in the left half of column whose sum determines the number of accompanying equations in the right half of column; related one-digit entries are tabulated under column B (or A), and also under each level of significance; 58 pages.

Totals in right margin	B (or A)†	Level of significance			
		.05	.025	.01	.005
$A + B = 3$	$C + D = 3$	3	0	—	—
$A + B = 4$	$C + D = 4$	4	0	0	—
	$C + D = 3$	4	0	—	—

$A + B = 7$	$C + D = 7$	7	3	2	1	1
		6	1	1	0	0
		5	0	0	—	—
		4	0	—	—	—
	$C + D = 6$	7	2	2	1	1
		6	1	0	0	0
		5	0	0	—	—
		4	0	—	—	—
	$C + D = 5$	7	2	1	0	0
		6	1	0	0	—
		5	0	—	—	—
	$C + D = 4$	7	1	1	0	0
		6	0	0	—	—
		5	0	—	—	—
	$C + D = 3$	7	0	0	0	—
		6	0	—	—	—
	$C + D = 2$	7	0	—	—	—

$A + B = 15$	$C + D = 15$	15	11	10	9	8
		14	9	8	7	6
		13	7	6	5	5
		12	6	5	4	4
		11	5	4	3	3
		10	4	3	2	2

$C + D = 3$	10	0	—	—	—
	15	1	1	0	0
	14	0	0	0	0
	13	0	0	—	—
	12	0	0	—	—
	11	0	—	—	—
$C + D = 2$	15	0	0	0	—
	14	0	0	—	—
	13	0	—	—	—

Source: D. J. Finney, "The Fisher-Yates Test of Significance in  $2 \times 2$  Contingency Tables," *Biometrika* 35: 149-54; with permission of the author and publisher.

† When B is entered in the middle column, the significance levels are for D. When A is used in place of B, the significance levels are for C.

$F_{\max}$  STATISTIC .01

2.8.H01

Row headings indicate degrees of freedom and range from 2 through 10 at intervals of 1, then 12, 15, 20, 30, 60,  $\infty$ ; column headings indicate the number of mean squares ( $k$ ) and range from 2 through 12 at intervals of 1; entries are tabulated to zero, one, or two decimal places; values are listed at the .01 level of significance and are in italic type, the lower of the double listings; 3 pages.

$F_{\max}$  STATISTIC .05

2.8.H05

Row headings indicate degrees of freedom and range from 2 through 10 at intervals of 1, then 12, 15, 20, 30, 60,  $\infty$ ; column headings indicate the number of mean squares ( $k$ ) and range from 2 through 12 at intervals of 1; entries are tabulated to zero, one, or two decimal places and are listed at the .05 level of significance; these entries are in regular type, the upper of the double listings; 2 pages.

$\frac{k}{df}$	2	3	4	5	6	7	8	9	10	11	12
2	39.0 <i>199.</i>	87.5 <i>448.</i>	142. <i>729.</i>	202. <i>1036.</i>	266. <i>1362.</i>	333. <i>1705.</i>	403. <i>2063.</i>	475. <i>2432.</i>	550. <i>2813.</i>	626. <i>3204.</i>	704. <i>3606.</i>
3	15.4 <i>47.5</i>	27.8 <i>85.</i>	39.2 <i>120.</i>	50.7 <i>151.</i>	62.0 <i>184.</i>	72.9 <i>216.*</i>	83.5 <i>249.*</i>	93.9 <i>281.*</i>	104. <i>310.*</i>	114. <i>337.*</i>	124. <i>361.*</i>
4	9.60 <i>23.2</i>	15.5 <i>37.</i>	20.6 <i>49.</i>	25.2 <i>59.</i>	29.5 <i>69.</i>	33.6 <i>79.</i>	37.5 <i>89.</i>	41.1 <i>97.</i>	44.6 <i>108.</i>	48.0 <i>113.</i>	51.4 <i>120.</i>
5	7.15 <i>14.9</i>	10.8 <i>22.</i>	13.7 <i>28.</i>	16.3 <i>33.</i>	18.7 <i>38.</i>	20.8 <i>42.</i>	22.9 <i>46.</i>	24.7 <i>50.</i>	26.5 <i>54.</i>	28.2 <i>57.</i>	29.9 <i>60.</i>
6	5.82 <i>11.1</i>	8.38 <i>15.5</i>	10.4 <i>19.1</i>	12.1 <i>22.</i>	13.7 <i>25.</i>	15.0 <i>27.</i>	16.3 <i>30.</i>	17.5 <i>32.</i>	18.6 <i>34.</i>	19.7 <i>36.</i>	20.7 <i>37.</i>
15	2.86 <i>4.07</i>	3.54 <i>4.9</i>	4.01 <i>5.5</i>	4.37 <i>6.0</i>	4.68 <i>6.4</i>	4.95 <i>6.7</i>	5.19 <i>7.1</i>	5.40 <i>7.3</i>	5.59 <i>7.5</i>	5.77 <i>7.8</i>	5.93 <i>8.0</i>
20	2.46 <i>3.32</i>	2.95 <i>3.8</i>	3.29 <i>4.3</i>	3.54 <i>4.6</i>	3.76 <i>4.9</i>	3.94 <i>5.1</i>	4.10 <i>5.3</i>	4.24 <i>5.5</i>	4.37 <i>5.6</i>	4.49 <i>5.8</i>	4.59 <i>5.9</i>
30	2.07 <i>2.63</i>	2.40 <i>3.0</i>	2.61 <i>3.3</i>	2.78 <i>3.4</i>	2.91 <i>3.6</i>	3.02 <i>3.7</i>	3.12 <i>3.8</i>	3.21 <i>3.9</i>	3.29 <i>4.0</i>	3.36 <i>4.1</i>	3.39 <i>4.2</i>
60	1.67 <i>1.96</i>	1.85 <i>2.2</i>	1.96 <i>2.3</i>	2.04 <i>2.4</i>	2.11 <i>2.4</i>	2.17 <i>2.5</i>	2.22 <i>2.5</i>	2.26 <i>2.6</i>	2.30 <i>2.6</i>	2.33 <i>2.7</i>	2.36 <i>2.7</i>
$\infty$	1.00 <i>1.00</i>	1.00 <i>1.00</i>	1.00 <i>1.00</i>	1.00 <i>1.00</i>	1.00 <i>1.00</i>	1.00 <i>1.00</i>	1.00 <i>1.00</i>	1.00 <i>1.00</i>	1.00 <i>1.00</i>	1.00 <i>1.00</i>	1.00 <i>1.00</i>

\* Values in the column  $k = 2$  and in the rows  $df = 2$  and  $\infty$  are exact. Elsewhere the third digit may be in error by a few units for  $F_{1,1}$  and several units for  $F_{1,\infty}$ . The third digit figures of values marked by an asterisk are the most uncertain.

SOURCE: Reproduced from Table 31 of E. S. Pearson and H. O. Hartley, *Biometrika Tables for Statisticians*, Vol 1, 2nd ed., 1958, published by the Syndics of the Cambridge University Press, London; used by permission of the authors and publishers.

## CRITICAL VALUES OF D IN THE KOLMOGOROV-SMIRNOV TEST

## 2.8.KS1

Values are tabulated for  $n$  from 5 through 50 at intervals of 5; levels of significance for a two-tailed test are: .20, .10, .05, .01; entries are tabulated to two decimal places; formulas are given for large values of  $n$ ; 1 page.

$n$	.20	.10	.05	.01
5	.45	.51	.56	.67
10	.32	.37	.41	.49
15	.27	.30	.34	.40
45	.16	.18	.20	.24
50	.15	.17	.19	.23
Large Values	$\frac{1.07}{\sqrt{n}}$	$\frac{1.22}{\sqrt{n}}$	$\frac{1.36}{\sqrt{n}}$	$\frac{1.63}{\sqrt{n}}$

## CRITICAL VALUES OF D IN THE KOLMOGOROV-SMIRNOV ONE-SAMPLE TEST

## 2.8.KS2

Values are listed for  $n$  from 1 through 20 at intervals of 1, from 20 through 35 at intervals of 5; levels of significance for a two-tailed test are: .20, .15, .10, .05, .01; entries are tabulated to three decimal places for 1 through 20 and for two decimal places for 20 through 35; formulas are given for values of  $n$  over 35; 3 pages.

Sample size ( $N$ )	Level of significance for $D = \text{maximum }  F_0(X) - S_N(X) $				
	.20	.15	.10	.05	.01
1	.900	.925	.950	.975	.995
2	.684	.726	.776	.842	.929
3	.565	.597	.642	.708	.828
4	.494	.525	.564	.624	.733
5	.446	.474	.510	.565	.669
25	.21	.22	.24	.27	.32
30	.19	.20	.22	.24	.29
35	.18	.19	.21	.23	.27
Over 35	$\frac{1.07}{\sqrt{N}}$	$\frac{1.14}{\sqrt{N}}$	$\frac{1.22}{\sqrt{N}}$	$\frac{1.36}{\sqrt{N}}$	$\frac{1.63}{\sqrt{N}}$

\* Adapted from F. J. Massey, Jr., "The Kolmogorov-Smirnov Test for Goodness of Fit," *J. Amer. Statist. Ass.*, 46, 70, 1951, with the kind permission of the author and publisher.

PROBABILITIES ASSOCIATED WITH VALUES AS LARGE AS OBSERVED VALUES OF H  
IN THE KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE BY RANKS

2.8.KW1

Column headings are: Sample sizes, H, p; subheadings under Sample sizes are:  
 $n_1$ ,  $n_2$ ,  $n_3$ , and consist of one-digit entries; entries under H are to four  
decimal places; entries under p are to three decimal places; 13 pages.

*Distribution function of H, P(H ≥ H'), for the Kruskal-Wallis test*

Sample sizes			H'	P	Sample sizes			H'	P
$n_1$	$n_2$	$n_3$			$n_1$	$n_2$	$n_3$		
2	1	1	2.7000	.500	4	3	2	6.4444	.008
2	2	1	3.6000	.200				6.3000	.011
2	2	2	4.5714	.067				5.4444	.046
			3.7143	.200				5.4000	.051
3	1	1	3.2000	.300	4	3	3	4.5111	.098
3	2	1	4.2857	.100				4.4444	.102
			3.8571	.133					
3	2	2	5.3572	.029				6.7455	.010
			4.7143	.048				6.7091	.013
			4.5(XX)	.067				5.7909	.046
			4.4(4.3)	.105	4	4	1	5.7273	.050
								4.7091	.092
								4.7000	.101
								6.6667	.010

5	4	1	6.9545	.008				5.6264	.051
			6.8400	.011				4.5451	.100
			4.9855	.044				4.5363	.102
			4.8600	.056					
			3.9873	.098	5	5	4	7.8229	.010
			3.9600	.102				7.7914	.010
5	4	2	7.2045	.009				5.6657	.049
			7.1182	.010				5.6429	.050
			5.2727	.049				4.5229	.099
			5.2682	.050				4.5200	.101
			4.5409	.098	5	5	5	8.0000	.009
			4.5182	.101				7.9800	.010
5	4	3	7.4449	.010				5.7800	.049
			7.3949	.011				5.6600	.051
			5.6564	.049				4.5600	.100
								4.5000	.102

From "Use of ranks in one-criterion analysis of variance." W. H. Kruskal and W. A. Wallis, *J. Amer. Statist. Assoc.*, Vol. 47 (1952) and Vol. 48 (1953). Reproduced with the kind permission of the authors and the publisher.

## PROBABILITIES ASSOCIATED WITH U

## 2.8.MW1

This table has six sections, one for each value of  $n_2$  from 3 through 8; row headings under U, and column headings under  $n_1$  increase successively with each section; row headings range from 0 through 5 for  $n_2 = 3$  to 0 through 32 for  $n_2 = 8$ ; column headings increase from 1 through 3 to 1 through 8; last section has two extra columns headed: t, Normal; entries are tabulated to three decimal places; 10 pages.

Table of Probabilities Associated with Values as Small as  
Observed Values of  $U$  in the Mann-Whitney Test

$n_2 = 3$			$n_2 = 4$					$n_2 = 5$						
$n_1 \backslash U$	1	2	3	$n_1 \backslash U$	1	2	3	4	$n_1 \backslash U$	1	2	3	4	5
0	.250	.100	.050	0	.200	.067	.028	.014	0	.167	.047	.018	.008	.004
1	.500	.200	.100	1	.400	.133	.057	.029	1	.333	.095	.036	.016	.008
2	.750	.400	.200	2	.600	.267	.114	.057	2	.500	.190	.071	.032	.016
3	.600	.350		3	.400	.200	.100		3	.667	.286	.125	.056	.028
4	.500			4	.600	.314	.171		4		.429	.196	.095	.048
5	.650			5		.429	.243		5		.571	.286	.143	.075
				6		.571	.343		6			.393	.206	.111
				7			.443		7			.500	.278	.155
				8				.657	8			.607	.365	.210
$n_2 = 6$			$n_2 = 7$					$n_2 = 8$						
$n_1 \backslash U$	1	2	3	4	5	6	$n_1 \backslash U$	1	2	3	4	5	6	7
0	.143	.036	.012	.005	.002	.001	0	.125	.028	.008	.003	.001	.001	.000
1	.286	.071	.024	.010	.004	.002	1	.250	.056	.017	.006	.003	.001	.001
2	.428	.143	.048	.019	.009	.004	2	.375	.111	.033	.012	.005	.002	.001
3	.571	.214	.083	.033	.015	.008	3	.500	.167	.058	.021	.009	.004	.002
4	.321	.131	.057	.026	.013		4	.625	.250	.092	.036	.015	.007	.003
$n_2 = 8$														
$n_1 \backslash U$	1	2	3	4	5	6	7	8	t	Normal				
0	.111	.022	.006	.002	.001	.000	.000	.000	3.308	.001				
1	.222	.044	.012	.004	.002	.001	.000	.000	3.203	.001				
2	.333	.089	.024	.008	.003	.001	.001	.000	3.098	.001				
3	.444	.133	.042	.014	.005	.002	.001	.001	2.993	.001				
4	.556	.200	.067	.024	.009	.004	.002	.001	2.888	.002				
5	.267	.097	.036	.015	.006	.003	.001	.001	2.783	.003				
27									.478	.323	.473	.318		
28									.522	.360	.368	.356		
29									.399	.263	.396			
30									.439	.158	.437			
31									.480	.052	.481			
32									.520					

SOURCE: H. B. Mann, and D. R. Whitney, "On a Test of Whether One of Two Random Variables Is Stochastically Larger than the Other," *Ann. Math. Statist.* 18, 52-54 (1947), with the kind permission of the authors and the publisher.

## CRITICAL VALUES OF U

## 2.8.MW1002

The level of significance is .001 for a one-tailed test, or .002 for a two-tailed test; values of  $n$  are tabulated from 1 through 20 as row headings; values of  $n_2$  are tabulated from 9 through 20 as column headings; entries are listed as one- or two-digit integers; 2 pages.

$n_2$	9	10	11	12	13	14	15	16	17	18	19	20
$n_1$												
1												
2												
3												
4		0	0	0	1	1	1	2	2	3	3	3
5	1	1	2	2	3	3	4	5	5	6	7	7
16	19	23	27	31	35	39	43	48	52	56	60	65
17	21	25	29	34	38	43	47	52	57	61	66	70
18	23	27	32	37	42	46	51	56	61	66	71	76
19	25	29	34	40	45	50	55	60	66	71	77	82
20	26	32	37	42	48	54	59	65	70	76	82	88

SOURCE: Tables 1, 3, 5, and 7 of D. Auble, "Extended Tables for the Mann-Whitney Statistic," *Bull. Inst. Educ. Res. Indiana Univ.* 1, No. 2 (1953), with the kind permission of the author and the publisher.

## CRITICAL VALUES OF U

## 2.8.MW102

The level of significance is .01 for a one-tailed test, and .02 for a two-tailed test; values of  $n$  range from 1 through 20 as row headings; values of  $n_2$  range from 9 through 20 as column headings; entries are tabulated as one- two- or three-digit integers; 2 pages.

$N_2$	9	10	11	12	13	14	15	16	17	18	19	20
$N_1$												
1												
2							0	0	0	0	0	1
3	1	1	1	2	2	2	3	3	4	4	4	5
4	3	3	4	5	5	6	7	7	8	9	9	10
5	5	6	7	8	9	10	11	12	13	14	15	16
6	7	8	9	11	12	13	15	16	18	19	20	22
16	31	36	41	46	51	56	61	66	71	76	82	87
17	33	38	44	49	55	60	66	71	77	82	88	93
18	36	41	47	53	59	65	70	76	82	88	94	100
19	38	44	50	56	63	69	75	82	88	94	101	107
20	40	47	53	60	67	73	80	87	93	100	107	114

## CRITICAL VALUES OF U.

## 2.8.MW105

The level of significance is .025 for a one-tailed test and .05 for a two-tailed test; values of  $n_1$  are tabulated from 1 through 20 as row headings; values of  $n_2$  are tabulated from 9 through 20 as column headings; entries are listed as one- or two-digit integers; 2 pages.

$n_2$	9	10	11	12	13	14	15	16	17	18	19	20
$n_1$												
1												
2	0	0	0	1	1	1	1	1	2	2	2	2
3	2	3	3	4	4	5	5	6	6	7	7	8
4	4	5	6	7	8	9	10	11	11	12	13	13
5	7	8	9	11	12	13	14	15	17	18	19	20
16	37	42	47	53	59	64	70	75	81	86	92	98
17	39	45	51	57	63	67	75	81	87	93	99	105
18	42	48	55	61	67	74	80	86	93	99	106	112
19	45	52	58	65	72	78	85	92	99	106	113	119
20	48	55	62	69	76	83	90	98	105	112	119	127

## CRITICAL VALUES OF U IN THE MANN-WHITNEY TEST

## 2.8.MW105A

Column headings are  $n_2$ ,  $n_1$ ; under  $n_2$  row headings range from 1 through 20 at intervals of 1, and under  $n_1$ , subheadings range from 1 through 20 at intervals of 1; entries are one- and two-digit integers, and are the critical values for a one-tailed test at 0.025 or a two-tailed test at .05; 3 pages.

$n_1$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
$n_2$																				
1																				
2																				
3																				
4																				
5	0	1	2	3	5	6	7	8	9	11	12	13	14	15	17	18	19	20		
6	1	2	3	5	6	8	10	11	13	14	16	17	19	21	22	24	25	27		
7	1	3	5	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34		
8	0	2	4	6	8	10	13	15	17	19	22	24	26	29	31	34	36	38	41	
9	0	2	4	7	10	12	15	17	20	23	26	28	31	34	37	39	42	45	48	
10	0	3	5	8	11	14	17	20	23	26	29	33	36	39	42	45	48	52	55	
15	1	5	10	14	19	24	29	34	39	44	49	54	59	64	70	75	80	85	90	
16	1	6	11	15	21	26	31	37	42	47	53	59	64	70	75	81	86	92	98	
17	2	6	11	17	22	28	34	39	45	51	57	63	67	75	81	87	93	99	105	
18	2	7	12	18	24	30	36	42	48	55	61	67	74	80	86	93	99	106	112	
19	2	7	13	19	25	32	38	45	52	58	65	72	78	85	92	99	106	113	119	
20	2	8	13	20	27	34	41	48	55	62	69	76	83	90	98	105	112	119	127	

## CRITICAL VALUES OF U

## 2.8.MW110

The level of significance for a one-tailed test is .05, and for a two-tailed test is .10; values of  $n_1$  range from 1 through 20 as row headings; values of  $n_2$  range from 9 through 20 as column headings; entries are tabulated as one- or two-digit integers; 2 pages.

$n_2 \backslash n_1$	9	10	11	12	13	14	15	16	17	18	19	20
1											0	0
2	1	1	1	2	2	2	3	3	3	4	4	4
3	3	4	5	5	6	7	7	8	9	9	10	11
4	6	7	8	9	10	11	12	14	15	16	17	18
5	9	11	12	13	14	16	18	19	20	22	23	25
16	42	48	54	60	65	71	77	83	89	95	101	107
17	45	51	57	64	70	77	83	89	96	102	109	115
18	48	55	61	68	75	82	88	95	102	109	116	123
19	51	58	65	72	80	87	94	101	109	116	123	130
20	54	62	69	77	84	92	100	107	115	123	130	138

## CRITICAL VALUES OF U IN THE MANN-WHITNEY TEST

## 2.8.MW110A

Column headings are  $n_2$ ,  $n_1$ ; under  $n_2$  row headings range from 1 through 20 at intervals of 1; column headings under  $n_1$  range from 1 through 20 at intervals of 1; entries are tabulated as one and two-digit integers, and are the critical values of a one-tailed test at .05 or a two-tailed test at .10; 3 pages.

$n_1 \backslash n_2$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1																		0	0	
2			0	0	0	1	1	1	2	2	2	2	3	3	3	3	4	4	4	
3		0	0	1	2	2	3	3	4	5	5	6	7	7	8	9	9	10	11	
4		0	1	2	3	4	5	6	7	8	9	10	11	12	14	15	16	17	18	
5	0	1	2	4	5	6	8	9	11	12	13	15	16	18	19	20	22	23	25	
6	0	2	3	5	7	8	10	12	14	16	17	19	21	23	25	26	28	30	32	
7	0	2	4	6	8	11	13	15	17	19	21	24	26	28	30	33	35	37	39	
8	1	3	5	8	10	13	15	18	20	23	26	28	31	33	36	39	41	44	47	
9	1	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	
10	1	4	7	11	14	17	20	24	27	31	34	37	41	44	48	51	55	58	62	
11	1	5	8	12	16	19	23	27	31	34	33	42	46	50	54	57	61	65	69	
12	2	5	9	13	17	21	26	30	34	38	42	47	51	55	60	64	68	72	77	
13	2	6	10	15	19	24	28	33	37	42	47	51	56	61	65	70	75	80	84	
14	2	7	11	16	21	26	31	36	41	46	51	56	61	66	71	77	82	87	92	
18		4	9	16	22	28	35	41	48	55	61	68	75	82	88	95	102	109	116	123
19	0	4	10	17	23	30	37	44	51	58	65	72	80	87	94	101	109	116	123	130
20	0	4	11	18	25	32	39	47	54	62	69	77	84	92	100	107	115	123	130	138

\* For specific details on the use of this table, see page 526.

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## DISTRIBUTION FUNCTION OF U

## 2.8.MW2

This table has eight sections corresponding to the values of  $n_2 = 3, n_2 = 4 \dots n_2 = 10$ ; for each section values of U are tabulated as row headings, from 0 through 4 for  $n_2 = 3$ , each section increasing in row headings as values of  $n$  increase,  $n_2 = 10$  having row headings under U from 0 through 50; column headings also increase respectively in each section from 1 through 3 for  $n_2 = 3$  to 1 through 50 for  $n_2 = 10$ ; entries are tabulated to four decimal places; 23 pages.

$P(U \leq U_0)$ ;  $U_0$  is the argument  
 $n_1 \leq n_2$ ;  $3 \leq n_2 \leq 10$

$n_2 = 3$			
$n_1$	1	2	3
0	.25	.10	.05
1	.50	.20	.10
$U_0$	2	.40	.20
3	.60	.35	
4		.50	

$n_2 = 4$				
$n_1$	1	2	3	4
0	.2000	.0667	.0286	.0143
1	.4000	.1333	.0571	.0286
2	.6000	.2667	.1143	.0571
3		.4000	.2000	.1000
$U_0$	4		.6000	.3143
5				.1714
6				.4286
7				.2429
8				.5714
				.3429
				.4429
				.5571

$n_2 = 5$				
$n_1$	1	2	3	4
0	.1667	.0476	.0179	.0079
				.0040

$n_2 = 6$						
$n_1$	1	2	3	4	5	6
0	.1429	.0357	.0119	.0048	.0022	.0011

$n_2 = 7$							
$n_1$	1	2	3	4	5	6	7
0	.1250	.0278	.0083	.0030	.0013	.0006	.0003

$n_2 = 8$								
$n_1$	1	2	3	4	5	6	7	8
0	.1111	.0222	.0061	.0020	.0008	.0003	.0002	.0001

$n_2 = 9$									
$n_1$	1	2	3	4	5	6	7	8	9
0	.1000	.0182	.0045	.0014	.0005	.0002	.0001	.0000	.0000

$n_2 = 10$										
$n_1$	1	2	3	4	5	6	7	8	9	10
0	.0909	.0152	.0035	.0010	.0003	.0001	.0001	.0000	.0000	.0000
1	.1818	.0303	.0070	.0020	.0007	.0002	.0001	.0000	.0000	.0000
2	.2727	.0606	.0140	.0040	.0013	.0005	.0002	.0001	.0000	.0000
3	.3636	.0909	.0245	.0070	.0023	.0009	.0004	.0002	.0001	.0000
4	.4545	.1364	.0385	.0120	.0040	.0015	.0006	.0003	.0001	.0001

48		.4559
49		.4853
50		.5147

## CRITICAL VALUES OF U

### 2.8.MW201

The level of significance is .005 for a one-tailed test or .01 for a two-tailed test; values of  $n_1$  and  $n_2$  are tabulated from 1 through 20 with entries under  $n_2$  being row headings; subheadings under  $n_1$  are column headings; values are tabulated as pairs of integers with 1, 2, or 3 digits; 7 pages.

$n_1$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
$n_2$	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	0		
3	--	--	--	--	--	--	--	--	0	0	0	35	38	41	2	43	2	46	2	52	3	57
19	--	0	3	7	12	17	22	28	33	39	45	51	56	63	69	74	81	87	93	99	281	
20	--	0	3	8	13	18	24	30	36	42	48	54	60	67	73	79	86	92	99	105	295	

(Dashes in the body of the table indicate that no decision is possible at the stated level of significance.)

Source: From Mann, H. B., and Whitney, D. R., "On a test of whether one of two random variables is a stochastically larger than the other," *Annals of Mathematical Statistics*, 1947, 18, 50-60, and Auble, D., "Extended tables for the Mann-Whitney statistic," *Bulletin of the*

## CRITICAL VALUES OF U

### 2.8.MW202

The level of significance is .01 for a one-tailed test or .02 for a two-tailed test; column headings are:  $n_2$ ,  $n_1$ ; row headings under  $n_2$  range from 1 through 20, as do column headings under  $n_1$ ; entries are tabulated as pairs of integers containing 1, 2, or 3 digits; 7 pages.

$n_1$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
$n_2$	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
2	--	--	--	--	--	--	--	--	--	--	0	0	0	0	0	1	1	1	39	39	
3	--	--	--	--	--	--	0	0	1	1	2	2	2	3	3	4	4	4	5	55	
19	--	1	4	9	15	20	26	32	38	44	50	56	63	69	75	82	88	94	101	107	273
20	--	1	5	10	16	22	28	34	40	47	53	60	67	73	80	87	93	100	107	114	286

(Dashes in the body of the table indicate that no decision is possible at the stated level of significance.)

Institute of Educational Research at Indiana University, 1953, 1, No. 2, as used in Runyon and Haber, *Fundamentals of Behavioral Statistics*, 1967, Addison-Wesley, Reading, Mass.

If the observed value of  $U$  falls between the two values presented in the table for  $n_1$  and  $n_2$ , accept  $H_0$ . Otherwise, reject  $H_0$ .

## CRITICAL VALUES OF U'

## 2.8.MW205

The level of significance is .025 for a one-tailed test or .05 for a two-tailed test; column headings and row headings range from 1 through 20 at intervals of 1; entries are tabulated as pairs of integers containing 1, 2, or 3 digits; 7 pages.

$n_1 \backslash n_2$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
2	--	--	--	--	--	--	--	0 16	0 18	0 20	0 22	1 23	1 25	1 27	1 29	1 31	2 32	2 34	2 36	2 38
3	--	--	--	0 15	1 17	1 20	2 22	2 25	3 27	3 30	4 32	4 35	5 37	5 40	6 42	6 45	7 47	7 50	7 52	
18	--	2 34	7 47	12 60	18 72	24 84	30 96	36 108	42 120	48 132	55 143	61 155	67 167	74 178	80 190	86 202	93 213	99 225	106 236	112 248
19	--	2 36	7 50	13 63	19 76	25 89	32 101	38 114	45 126	52 138	58 151	65 163	72 175	78 188	85 200	92 212	99 224	106 236	113 248	119 261
20	--	2 38	8 52	13 67	20 80	27 93	34 106	41 119	48 132	55 145	62 158	69 171	76 184	83 197	90 210	98 222	105 235	112 248	119 261	127 273

(Dashes in the body of the table indicate that no decision is possible at the stated level of significance.)

## CRITICAL VALUES OF U

## 2.8.MW210

The level of significance is .05 for a one-tailed test or .10 for a two-tailed test; column headings and row headings range from 1 through 20 at intervals of 1; entries are tabulated as pairs of integers containing 1, 2, or 3 digits; 7 pages.

$n_1 \backslash n_2$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0 19	0 20	
2	--	--	--	0 10	0 12	0 14	1 15	1 17	1 19	1 21	2 22	2 24	2 26	3 27	3 29	3 31	4 32	4 34	4 36	
3	--	0 9	0 12	1 14	2 16	2 19	3 21	3 24	4 26	5 28	5 31	6 33	7 35	7 38	8 40	9 42	9 45	10 47	11 49	
18	--	4 32	9 45	16 56	22 68	28 80	35 91	41 103	48 114	55 123	61 137	68 148	75 159	82 170	88 182	95 193	102 204	109 215	116 226	123 237
19	0 19	4 34	10 47	17 59	23 72	30 84	37 96	44 108	51 120	58 132	65 144	72 156	80 167	87 179	94 191	101 203	109 214	116 226	123 238	130 250
20	0 20	4 36	11 49	18 62	25 75	32 88	39 101	47 113	54 126	62 138	69 151	77 163	84 176	92 188	100 200	107 213	115 225	123 237	130 250	138 262

(Dashes in the body of the table indicate that no decision is possible at the stated level of significance.)

## CONVERSION OF A PEARSON $r$ INTO A CORRESPONDING FISHER'S $z$ COEFFICIENT

### 2.8.P1

Column headings are:  $r$ ,  $z$ ; values under  $r$  range from .25 through .90 at intervals of .01, from .90 through .995 at intervals of .005; entries under  $z$  are tabulated to two decimal places; 3 pages.

$r$	$z$	$r$	$z$	$r$	$z$	$r$	$z$	$r$	$z$
.25*	.26	.40	.42	.55	.62	.70	.87	.85	1.26
.26	.27	.41	.44	.56	.63	.71	.89	.86	1.29
.27	.28	.42	.45	.57	.65	.72	.91	.87	1.33
.28	.29	.43	.46	.58	.66	.73	.93	.88	1.38
.29	.30	.44	.47	.59	.68	.74	.95	.89	1.42
								.950	1.83
								.955	1.89
								.960	1.95
								.965	2.01
								.970	2.09
.33	.34	.48	.52	.63	.74	.78	1.05	.915	1.56
.34	.35	.49	.54	.64	.76	.79	1.07	.920	1.59
								.990	2.65
								.995	2.99
.38	.40	.53	.59	.68	.83	.83	1.19	.940	1.74
.39	.41	.54	.60	.69	.85	.84	1.22	.945	1.78

\*The values in this table were derived by interpolation from Table VB in Fisher's *Statistical Method for Research Workers* and are published by permission of the publisher, Oliver & Boyd, Edinburgh and London, 1932.

\*For all values of  $r$  below .25,  $r = z$  to two decimal places.

## CRITICAL VALUES OF THE PEARSON PRODUCT MOMENT CORRELATION COEFFICIENT

### 2.8.P110

Degrees of freedom ( $N-2$ ) range from 1 through 20 at intervals of 1, from 20 through 50 at intervals of 5, from 50 through 100 at intervals of 10; one-tailed levels of significance are: .05, .025, .01, .005, .0005 while two-tailed levels of significance are: .10, .05, .02, .01, .001; entries are tabulated to four decimal places; explanatory note precedes table; 3 pages.

$df = N - 2$	Level of significance for one-tailed test				
	.05	.025	.01	.005	.0005
	Level of significance for two-tailed test				
1	.9877	.9969	.9995	.9999	1.0000
2	.9000	.9500	.9800	.9900	.9990
3	.8054	.8783	.9343	.9587	.9912
4	.7293	.8114	.8822	.9172	.9741
5	.6694	.7545	.8329	.8745	.9507
25	.3233	.3809	.4451	.4869	.5974
30	.2960	.3494	.4093	.4487	.5541
35	.2746	.3246	.3810	.4182	.5189
40	.2573	.3044	.3578	.3932	.4896
70	.1954	.2319	.2737	.3017	.3799
80	.1829	.2172	.2565	.2830	.3568
90	.1726	.2050	.2422	.2673	.3375
100	.1638	.1946	.2301	.2540	.3211

Source: Table D is taken from Table VII of Fisher and Yates, *Statistical Tables for Biological, Agricultural, and Medical Research*, published by Oliver and Boyd, Ltd., Edinburgh, and by permission of the authors and publishers.

If the observed value of  $r$  is greater than or equal to the tabled value for the appropriate level of significance (columns) and degrees of freedom (rows), then reject  $H_0$ . The degrees of freedom are the number of pairs of scores minus two, or  $N - 2$ .

## CRITICAL VALUES FOR THE SPEARMAN RANK-ORDER CORRELATION COEFFICIENT

## 2.8.S1

Values of N range from 5 through 30 at intervals of 1; levels of significance for a one-tailed test are: .05, .025, .005, .001 while levels of significance for a two-tailed test are: .10, .05, .01, .002; entries are tabulated to three decimal places; an explanation precedes table; 3 pages.

N	Significance level for a one-tailed test at			
	.05	.025	.005	.001
	Significance level for a two-tailed test at			
N	.10	.05	.01	.002
5	.900	1.000		
6	.829	.886	1.000	
7	.715	.786	.929	1.000
8	.620	.715	.881	.953
9	.600	.700	.834	.917
27	.325	.383	.493	.577
28	.319	.376	.484	.567
29	.312	.369	.475	.558
30	.307	.363	.467	.549

Source: Glasser, G. J., and R. F. Winter, "Critical Values of the Coefficient of Rank Correlation for Testing the Hypothesis of Independence," *Biometrika*, 48, 444 (1961).

## CRITICAL VALUES OF SPEARMAN'S RANK CORRELATION COEFFICIENT

## 2.8.S2

Values of N range from 5 through 30 at intervals of 1; levels of significance are: .10, .05, .02, .01; entries are tabulated to three decimal places; 2 pages.

n	two-tailed test			
	$\alpha = 0.10$	$\alpha = 0.05$	$\alpha = 0.02$	$\alpha = 0.01$
5	0.900	—	—	—
6	0.829	0.886	0.943	—
7	0.714	0.786	0.893	—
8	0.643	0.738	0.833	0.881
9	0.600	0.683	0.783	0.833
10	0.564	0.648	0.745	0.794
26	0.329	0.392	0.465	0.515
27	0.323	0.385	0.456	0.505
28	0.317	0.377	0.448	0.496
29	0.311	0.370	0.440	0.487
30	0.305	0.364	0.432	0.478

From E. G. Olds, "Distributions of sums of squares of rank differences for small numbers of individuals," *The Annals of Statistics*, Vol. 9 (1938), pp. 138-148, and amended, Vol. 20 (1949), pp. 117-118. Reprinted by permission.

CRITICAL VALUES OF  $r_s$ , THE SPEARMAN RANK CORRELATION COEFFICIENT

## 2.8.S3

Values of  $N$  range from 4 through 10 at intervals of 1, from 10 through 30 at intervals of 2; levels of significance are: .05, .01 for a one-tailed test; entries are tabulated to three decimal places; 1 page.

$N$	Significance level (one-tailed test)	
	.05	.01
4	1.000	
5	.900	1.000
6	.829	.943
7	.714	.893
8	.643	.833
24	.343	.485
26	.329	.465
28	.317	.448
30	.306	.432

SOURCE: E. G. Olds, "Distributions of Sums of Squares of Rank Differences for Small Numbers of Individuals," *Ann. Math. Statist.* 9, 133-148 (1938).

## SPEARMAN'S RANK CORRELATION COEFFICIENT

## 2.8.S4

Values of  $n$  range from 5 through 30 at intervals of 1; levels of significance are: .05, .025, .01, .005; entries are tabulated to three decimal places; 2 pages.

$n$	$\alpha = 0.05$	$\alpha = 0.025$	$\alpha = 0.01$	$\alpha = 0.005$
5	0.900	—	—	—
6	0.829	0.886	0.943	—
7	0.714	0.786	0.893	—
8	0.643	0.738	0.833	0.881
9	0.600	0.683	0.783	0.833
26	0.329	0.392	0.465	0.515
27	0.323	0.385	0.456	0.505
28	0.317	0.377	0.448	0.496
29	0.311	0.370	0.440	0.487
30	0.305	0.364	0.432	0.478

From "Distribution of Sums of Squares of Rank Differences for Small Samples," E. G. Olds, *Annals of Mathematical Statistics*, Volume 9 (1938). Reproduced with the kind permission of the Editor, *Annals of Mathematical Statistics*.

R VALUES AT THE .05, .02, AND .01 LEVELS FOR DIFFERENT NUMBERS OF  $N_1$  CASES IN TWO SAMPLES OF EQUAL SIZE

2.8.W05

Column headings are:  $N_1$ , .05, .02, .01; row headings under  $N_1$  range from 5 through 20 at intervals of 1; entries under remaining column headings are tabulated as two- or three digit integers; 1 page.

R is the smaller sum of ranks.

$N_1$	$P = .05$	$P = .02$	$P = .01$
5	18	16	15
6	27	24	23
7	37	34	32
8	49	46	44
9	63	59	56
17	241	230	223
18	271	259	252
19	303	291	282
20	338	324	315

\*Reproduced by permission from Wilcoxon, F. *Some Rapid Approximate Statistical Procedures*. Stamford, Conn.: American Cyanamid Co., 1949.

CRITICAL VALUES OF T IN THE WILCOXON MATCHED-PAIRS SIGNED-RANKS TEST

2.8.W105

Values of N range from 6 through 25 at intervals of 1; levels of significance for a one-tailed test are: .025, .01, .005, while for a two-tailed test levels of significance are: .05, .02, .01; entries are tabulated as one- or two-digit integers; 2 pages.

$N$	Level of significance, direction predicted		
	.025	.01	.005
$N$	Level of significance, direction not predicted		
	.05	.02	.01
6	0	—	—
7	2	0	—
8	4	2	0
9	6	3	2
10	8	5	3
22	66	56	49
23	73	62	55
24	81	69	61
25	89	77	68

SOURCE: F. Wilcoxon, *Some Rapid Approximate Statistical Procedures*, American Cyanamid Company, New York, 1949, table I, p. 13, with the kind permission of the author and publisher.

## CRITICAL VALUES OF T

## 2.8.W210

Column heading n (sample size) has row headings which range from 5 through 25 at intervals of 1; levels of significance for a one-tailed test are: 0.050, 0.025, 0.010, 0.005 while levels of significance for a two-tailed test are: 0.100, 0.050, 0.020, 0.010; entries are tabulated as one- or two-digit integers; 3 pages.

Sample Size n	One-tailed Test for $\alpha =$			
	0.050	0.025	0.010	0.005
	0.100	0.050	0.020	0.010
5	1	—	—	—
6	2	1	—	—
7	4	2	—	—
8	6	4	2	—
9	8	6	3	2
23	83	73	62	55
24	92	81	69	61
25	101	90	77	68

## CRITICAL VALUES OF W FOR THE WILCOXON TEST

## 2.8.W310

Row headings under N range from 5 through 50 at intervals of 1; levels of significance for a one-tailed test are: .05, .025, .01, .005 while levels of significance for a two-tailed test are: .10, .05, .02, .01; entries are tabulated as one- two- or three-digit integers; short explanation precedes table; 3 pages.

N	Level of significance for one-tailed test				N	Level of significance for one-tailed test			
	.05	.025	.01	.005		.05	.025	.01	.005
	Level of significance for two-tailed test					Level of significance for two-tailed test			
N	.10	.05	.02	.01	N	.10	.05	.02	.01
5	0	--	--	--	28	130	116	101	91
6	2	0	--	--	29	140	126	110	100
7	3	2	0	--	30	151	137	120	109
8	5	3	1	0	31	163	147	130	118
9	8	5	3	1	32	175	159	140	128
23	83	73	62	54	46	389	361	328	307
24	91	81	69	61	47	407	378	345	322
25	100	89	76	68	48	426	396	362	339
26	110	98	84	75	49	446	415	379	355
27	119	107	92	83	50	466	434	397	373

Source: From F. Wilcoxon, S. Katte, and R. A. Wilcox, *Critical Values and Probability Levels for the Wilcoxon Rank Sum Test and the Wilcoxon Signed Rank Test*, New York, American Cyanamid Co., 1963, and F. Wilcoxon and R. A. Wilcox, *Some Rapid Approximate Statistical Procedures*, New York, Lederle Laboratories, 1964 as used in Runyon and Haber, *Fundamentals of Behavioral Statistics*, 1967, Addison-Wesley, Reading, Mass.

## CRITICAL VALUES OF T IN THE WILCOXON TEST

2.8.W311

Values of n are tabulated from 5 through 50; levels of significance for a one-tailed test are: .05, .025, .01, .005 while for a two-tailed test levels of significance are: .10, .05, .02, .01; entries are tabulated as one- two- or three digit integers; short explanation precedes table; print format has been altered in braille transcription; 3 pages.

$n = 5(1)50$								
One-sided	Two-sided	$n = 5$	$n = 6$	$n = 7$	$n = 8$	$n = 9$	$n = 10$	
$P = .05$	$P = .10$	1	2	4	6	8	11	
$P = .025$	$P = .05$		1	2	4	6	8	
$P = .01$	$P = .02$			0	2	3	5	
$P = .005$	$P = .01$				0	2	3	
One-sided	Two-sided	$n = 11$	$n = 12$	$n = 13$	$n = 14$	$n = 15$	$n = 16$	
$P = .05$	$P = .10$	14	17	21	26	30	36	
$P = .025$	$P = .05$	11	14	17	21	25	30	
$P = .01$	$P = .02$	7	10	13	16	20	24	
$P = .005$	$P = .01$	5	7	10	13	16	19	
One-sided	Two-sided	$n = 29$	$n = 30$	$n = 31$	$n = 32$	$n = 33$	$n = 34$	
$P = .05$	$P = .10$	141	152	163	175	188	201	
$P = .025$	$P = .05$	127	137	148	159	171	183	
$P = .01$	$P = .02$	111	120	130	141	151	162	
$P = .005$	$P = .01$	100	109	118	128	138	149	
One-sided	Two-sided	$n = 40$	$n = 41$	$n = 42$	$n = 43$	$n = 44$	$n = 45$	
$P = .05$	$P = .10$	287	303	319	336	353	371	
$P = .025$	$P = .05$	264	279	295	311	327	344	
$P = .01$	$P = .02$	238	252	267	281	297	313	
$P = .005$	$P = .01$	221	234	248	262	277	292	
One-sided	Two-sided	$n = 46$	$n = 47$	$n = 48$	$n = 49$	$n = 50$		
$P = .05$	$P = .10$	389	408	427	446	466		
$P = .025$	$P = .05$	361	379	397	415	434		
$P = .01$	$P = .02$	329	345	362	380	398		
$P = .005$	$P = .01$	307	323	339	356	373		

From "Some Rapid Approximate Statistical Procedures" (1964), 28, F. Wilcoxon and R. A. Wilcox. Reproduced with the kind permission of R. A. Wilcox and the Lederle Laboratories.

## TOTAL NUMBER OF RUNS

## 2.8.ZZ

Column headings 5 through 20 represent the larger of  $n_1$  and  $n_2$ , while row headings 2 through 20 represent the smaller of  $n_1$  and  $n_2$ ; each double entry has the smaller amount on top, the larger below, and is blocked; entries are one- or two-digit integers; print shows row headings midway between the two, while braille places them on the row with the top of the two numbers constituting a pair; 6 pages.

															The larger of $n_1$ and $n_2$					
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20																				
2							2	2	2	2	2	2	2	2	2	2	2	2	2	
3	2 8	2 8	2 8	2 8	2 8	2 8	2 8	2 8	2 8											
4	2 9	2 10	2 10	3 10	3 10	3 10	3 10	3 10	3 10	3 10	3 10	3 10								
5	2 10	3 10	3 11	3 11	3 12	3 12	3 12	3 12	3 12	3 12	3 12	3 12	3 12							
6	3 11	3 12	3 12	4 13	4 13	4 13	4 13	4 13	4 13	4 13	4 13	4 13								
7				3 13	4 13	4 14	4 14	4 14	5 14	5 14	5 14	5 14	5 14	5 14	5 14	5 14	5 14	5 14	5 14	
8					4 14	5 14	5 15	5 15	5 15	5 15	5 15	5 15	5 15	5 15	5 15	6 16	6 16	6 16	6 16	6 16
9						5 15	5 16	6 16	6 16	6 17	6 17	7 17	7 17	7 17	7 17	7 17	7 17	7 17	7 17	7 17
10							6 16	6 17	7 17	7 18	7 18	7 18	7 18	7 18	7 18	8 19	8 19	8 19	8 19	8 19
11								7 17	7 18	7 19	7 19	7 19	7 19	7 19	8 20	8 20	8 20	9 20	9 21	
12									7 19	8 19	8 20	8 20	8 21	8 21	9 21	9 21	9 22	10 22	10 22	
13										8 20	9 20	9 21	9 21	9 22	9 22	10 23	10 23	10 23	10 23	10 23
15											10 22	10 23	11 23	11 24	11 24	12 25				
16												11 23	11 24	11 25	11 25	12 25	12 25	12 25		
17													11 25	12 25	12 26	12 26	13 26			
18														12 26	13 26	13 27	13 27			
19															13 27	13 27				
20																14 28				

From C. Eisenhart and F. Swed, "Tables for testing randomness of grouping in a sequence of alternatives," *The Annals of Statistics*, Vol. 14 (1943), pp. 66-87. Reprinted by permission.

## DISTRIBUTION OF THE TOTAL NUMBER OF RUNS

2.8.ZZ1

This table gives the sampling distribution for values of  $(n_1, n_2)$  less than or equal to 10; column heading  $(n_1, n_2)$  lists a series of paired numbers (2, 3), (2, 4), (2, 5) through (2, 10) then (3, 3), (3, 4) through (3, 10) etc. in like manner through (10, 10); column heading "a" has subheadings 2 through 20; entries indicate the probability of that number or fewer runs occurring; these entries are tabulated to three decimal places; 9 pages.

$(n_1, n_2)$	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
(2,3)	.200	.500	.900	1.000															
(2,4)	.133	.400	.800	1.000															
(2,5)	.095	.333	.714	1.000															
(2,6)	.071	.286	.643	1.000															
(2,7)	.056	.250	.583	1.000															
(2,8)	.044	.222	.533	1.000															
(2,9)	.036	.200	.491	1.000															
(2,10)	.030	.182	.455	1.000															
(3,3)	.100	.300	.700	.900	1.000														
(3,4)	.057	.200	.543	.800	.971	1.000													
(3,5)	.036	.143	.429	.714	.929	1.000													
(3,6)	.024	.107	.345	.643	.881	1.000													
(3,7)	.017	.083	.283	.583	.833	1.000													
(3,8)	.012	.067	.236	.533	.788	1.000													
(3,9)	.009	.055	.200	.491	.745	1.000													
(3,10)	.007	.045	.171	.455	.706	1.000													
(6,6)	.002	.013	.067	.175	.392	.608	.825	.933	.987	.998	1.000								
(6,7)	.001	.008	.043	.121	.296	.500	.733	.879	.966	.992	.999	1.000							
(6,8)	.001	.005	.028	.086	.226	.413	.646	.821	.937	.984	.998	1.000							
(6,9)	.000	.003	.019	.063	.175	.343	.566	.762	.902	.972	.994	1.000							
(6,10)	.000	.002	.013	.047	.137	.288	.497	.706	.864	.958	.990	1.000							
(9,9)	.000	.000	.003	.012	.044	.109	.238	.399	.601	.762	.891	.956	.988	.997	1.000				
(9,10)	.000	.000	.002	.008	.029	.077	.179	.319	.510	.681	.834	.923	.974	.992	.999	1.000			
(10,10)	.000	.000	.001	.004	.019	.051	.128	.242	.414	.586	.758	.872	.949	.981	.996	.999	1.000	1.000	1.000

CRITICAL VALUES FOR THE RUNS TEST

2.8.ZZ120

CRITICAL VALUES FOR THE RUNS TEST      2.8.ZZ120

Column headings range from 2 through 20 at intervals of 1; row headings range from 3 through 20 at intervals of 1; each row heading has four subheadings: 0.20, 0.10, 0.05, 0.01 (levels of significance) presented vertically with each row heading; each entry is an integer pair corresponding to each level of significance; each integer pair is of the form: m, n; m and n are one- or two-digit integers; explanatory note precedes the table; 22 pages.

$n_1$	"2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
3	0.20	2, 5	2, 6																
	0.10	0, 5	2, 6																
	0.05	0, 6	0, 7																
	0.01	0, 6	0, 7	(4)															
4	0.20	2, 5	3, 7	3, 7															
	0.10	0, 6	2, 7	2, 8															
	0.05	0, 6	0, 7	2, 8															
	0.01	0, 6	0, 8	0, 9	(5)														
5	0.20	2, 6	3, 7	3, 8	4, 8														
	0.10	2, 6	2, 7	3, 8	3, 9														
	0.05	0, 6	2, 8	2, 9	3, 9														
	0.01	0, 6	0, 8	0, 9	2, 10														
12	0.20	3, 6	4, 8	5, 9	6, 10	6, 12	7, 12	8, 13	8, 14	9, 15	9, 16	9, 17	10, 16	11, 17	12, 18	12, 19	13, 19	(19)	
	0.10	2, 6	3, 8	4, 10	5, 11	6, 12	6, 13	7, 14	7, 15	8, 16	9, 16	9, 17	10, 18	10, 19	11, 19	11, 20	12, 20		
	0.05	2, 6	3, 8	4, 10	4, 12	5, 13	6, 14	6, 15	7, 16	7, 17	8, 17	8, 18	9, 19	10, 20	10, 21	10, 21	22, 21		
	0.01	0, 6	2, 8	3, 10	3, 12	4, 14	4, 15	5, 16	5, 17	6, 18	6, 18	7, 19	7, 20	8, 21	8, 22	8, 23	9, 23		
15	0.20	3, 6	4, 8	5, 10	6, 11	7, 12	8, 13	9, 14	9, 15	10, 16	11, 17	11, 17	12, 18	12, 19	13, 20	14, 21	15, 22	16, 23	16, 24
	0.10	2, 6	4, 8	4, 10	5, 12	6, 13	7, 14	8, 15	8, 16	9, 17	10, 18	11, 19	11, 20	12, 21	13, 22	14, 23	14, 24	15, 24	15, 25
	0.05	2, 6	3, 8	4, 10	5, 12	6, 14	7, 15	8, 16	8, 18	9, 19	10, 20	10, 21	11, 22	12, 23	13, 24	13, 25	14, 25	14, 26	
	0.01	0, 6	2, 8	3, 10	4, 12	4, 14	5, 16	5, 17	6, 18	7, 19	7, 20	8, 21	8, 22	8, 23	9, 23				
19	0.20	3, 6	4, 8	6, 10	7, 12	8, 13	8, 14	9, 15	10, 16	11, 17	12, 18	13, 19	13, 20	14, 20	14, 21	15, 22	16, 23	16, 24	
	0.10	3, 6	4, 8	5, 10	6, 12	7, 14	8, 15	8, 16	9, 17	10, 18	11, 19	11, 20	12, 21	13, 22	14, 23	14, 24	15, 24	15, 25	
	0.05	2, 6	3, 8	4, 10	5, 12	6, 14	7, 15	8, 16	8, 18	9, 19	10, 20	10, 21	11, 22	12, 23	13, 24	13, 25	14, 25	14, 26	
	0.01	2, 6	2, 8	3, 10	4, 12	5, 14	6, 16	6, 18	7, 19	8, 20	8, 22	9, 23	9, 24	10, 24	10, 25	11, 26	11, 27	12, 27	(20)
20	0.20	3, 6	4, 8	6, 10	7, 12	8, 13	9, 14	10, 15	10, 16	11, 17	12, 18	13, 19	13, 20	14, 21	15, 22	16, 23	16, 23	17, 24	
	0.10	3, 6	4, 8	5, 10	6, 12	7, 14	8, 15	9, 16	10, 17	10, 18	11, 19	12, 20	12, 21	13, 22	14, 23	14, 24	15, 24	15, 25	16, 25
	0.05	2, 6	3, 8	4, 10	5, 12	6, 14	7, 15	8, 16	9, 18	9, 19	10, 20	11, 21	11, 22	12, 23	13, 24	13, 25	14, 26	15, 27	
	0.01	2, 6	2, 8	3, 10	4, 12	5, 14	6, 16	6, 18	7, 19	8, 20	8, 22	9, 23	10, 24	11, 26	11, 27	12, 27	12, 29	13, 29	

CRITICAL VALUES OF  $r$  IN THE RUNS TEST

2.8.ZZ205

This table is divided into parts a and b; in each part values of row headings and column headings range from 2 through 20 at intervals of 1; entries are critical values of  $r$  expressed as one- or two-digit integers; an explanatory note precedes table; 9 pages.

(a)

$n_1$	$n_2$																		
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2											2	2	2	2	2	2	2	2	2
3						2	2	2	2	2	2	2	2	3	3	3	3	3	3
4					2	2	2	3	3	3	3	3	3	3	4	4	4	4	4
18	2	3	4	5	6	7	8	8	9	9	10	10	11	11	12	12	13	13	13
19	2	3	4	5	6	6	7	8	8	9	10	10	11	11	12	12	13	13	13
20	2	3	4	5	6	6	7	8	9	9	10	10	11	12	12	13	13	13	14

(b)

$n_1$	$n_2$																		
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2																			
3																			
4																			
18											17	18	19	20	21	22	23	24	25
19											17	18	20	21	22	23	23	24	25
20											17	18	20	21	22	23	24	25	26

SOURCE: Adapted from Frieda S. Swed and C. Eisenhart, "Tables for testing randomness of grouping in a sequence of alternatives," *Annals of Mathematical Statistics*, 1943, 14, 83-86. Reproduced from S. Siegel, *Nonparametric Statistics for the Behavioral Sciences*, New York: McGraw-Hill, 1956. Reprinted by permission of the authors, Institute of Mathematical Statistics, and McGraw-Hill Book Company.

## CRITICAL VALUES FOR THE SIGN TEST

2.8.ZZ3

Column headings are  $n$ ,  $\alpha$ ; row headings under  $n$  range from 1 through 100 at intervals of 1; column headings under  $\alpha$  are: .01, .05, .10, .25 for a two-tailed test; entries are tabulated as one- or two-digit integers, and are the critical values for the number of the least frequent sign for a two-tailed test at  $\alpha$  for the binomial  $p = 0.05$ ; 5 pages.

$n$	$\alpha$				$n$	$\alpha$			
	0.01	0.05	0.10	0.25		0.01	0.05	0.10	0.25
1					51	15	18	19	20
2					52	16	18	19	21
3			0		53	16	18	20	21
4		0	0		54	17	19	20	22
5	0	0			55	17	19	20	22
46	13	15	16	18	96	34	37	39	41
47	14	16	17	19	97	35	38	39	42
48	14	16	17	19	98	35	38	40	42
49	15	17	18	19	99	36	39	40	43
50	15	17	18	20	100	36	39	41	43

Reprinted from Wilfred J. Dixon and Frank J. Massey, Jr., *Introduction to Statistical Analysis*, 3rd ed., McGraw-Hill Book Company, New York, 1969, p. 509.

## RANK-SUM CRITICAL VALUES

## 2.8.ZZ305

Sample sizes are tabulated in the form  $(n_1, n_2)$ ;  $n_1$  ranges from 2 through 10;  $n_2$  ranges from  $n_1$  through 10; with each size there is associated one or two pairs of critical values; a probability value to three decimal places is tabulated for each sample size and its associated pairs of critical values; explanatory note precedes table; 4 pages.

(2, 4)		(4, 4)		(6, 7)	
3	11	.067	11	25	.029
(2, 5)		(4, 5)		28	56
3	13	.047	12	24	.057
(2, 6)		(4, 6)		30	54
3	15	.036	13	27	.056
4	14	.071	(4, 7)		32 58
(2, 7)		12	32	.019	(6, 8)
3	17	.028	14	30	.057
4	16	.056	(6, 9)		31 65
(2, 8)		13	35	.021	(6, 10)
3	19	.022	15	33	.055
(2, 9)		(4, 8)		33	69
(2, 10)		(4, 9)		35	67
(3, 4)		(5, 5)		(7, 7)	
3	11	.067	11	25	.029
(3, 5)		(5, 6)		28	56
3	13	.047	12	24	.057
(3, 6)		(5, 7)		30	54
3	15	.036	13	27	.056
4	14	.071	(5, 8)		32 58
(3, 7)		12	32	.019	(6, 9)
3	17	.028	14	30	.057
4	16	.056	(6, 10)		31 65
(3, 8)		13	35	.021	(6, 11)
3	19	.022	15	33	.055
(3, 9)		(5, 9)		(7, 9)	
8	28	.024	22	53	.021
9	27	.042	25	50	.056
(3, 10)		(5, 10)		63	108
9	30	.032	24	56	.028
10	29	.050	26	54	.050
(3, 11)		(5, 11)		66	114
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 12)		(5, 12)		69	111
(3, 13)		(6, 6)		(8, 8)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 14)		(6, 7)		(8, 9)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 15)		(6, 8)		(8, 10)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 16)		(6, 9)		(8, 11)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 17)		(6, 10)		(8, 12)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 18)		(6, 11)		(8, 13)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 19)		(6, 12)		(8, 14)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 20)		(6, 13)		(8, 15)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 21)		(6, 14)		(8, 16)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 22)		(6, 15)		(8, 17)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 23)		(6, 16)		(8, 18)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 24)		(6, 17)		(8, 19)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 25)		(6, 18)		(8, 20)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 26)		(6, 19)		(8, 21)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 27)		(6, 20)		(8, 22)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 28)		(6, 21)		(8, 23)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 29)		(6, 22)		(8, 24)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 30)		(6, 23)		(8, 25)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 31)		(6, 24)		(8, 26)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 32)		(6, 25)		(8, 27)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 33)		(6, 26)		(8, 28)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 34)		(6, 27)		(8, 29)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 35)		(6, 28)		(8, 30)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 36)		(6, 29)		(8, 31)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 37)		(6, 30)		(8, 32)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 38)		(6, 31)		(8, 33)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 39)		(6, 32)		(8, 34)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 40)		(6, 33)		(8, 35)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 41)		(6, 34)		(8, 36)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 42)		(6, 35)		(8, 37)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 43)		(6, 36)		(8, 38)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 44)		(6, 37)		(8, 39)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 45)		(6, 38)		(8, 40)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 46)		(6, 39)		(8, 41)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 47)		(6, 40)		(8, 42)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 48)		(6, 41)		(8, 43)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 49)		(6, 42)		(8, 44)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 50)		(6, 43)		(8, 45)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 51)		(6, 44)		(8, 46)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 52)		(6, 45)		(8, 47)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 53)		(6, 46)		(8, 48)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 54)		(6, 47)		(8, 49)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 55)		(6, 48)		(8, 50)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 56)		(6, 49)		(8, 51)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 57)		(6, 50)		(8, 52)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 58)		(6, 51)		(8, 53)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 59)		(6, 52)		(8, 54)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 60)		(6, 53)		(8, 55)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 61)		(6, 54)		(8, 56)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 62)		(6, 55)		(8, 57)	
9	33	.024	26	52	.021
11	31	.056	28	50	.047
(3, 63)		(6, 56)		(8, 58)	
9	33	.024			

VALUES TO FACILITATE THE ESTIMATION OF THE COSINE-PI COEFFICIENT OF CORRELATION, WITH TWO-PLACE ACCURACY

2.8.ZZ5

This table has two headings;  $ad/bc$ ,  $r_{\cos\text{-pi}}$ ; entries under  $ad/bc$  are mainly to three decimal places, and are of the form  $x.xxx$  continuing to  $xxx.xx$ ; entries under  $r_{\cos\text{-pi}}$  are tabulated to three decimal places and range from .005 through .995 at intervals of .010; explanatory note precedes table: 5 pages.

$\frac{ad}{bc}$	$r_{\cos\text{-pi}}$	$\frac{ad}{bc}$	$r_{\cos\text{-pi}}$	$\frac{ad}{bc}$	$r_{\cos\text{-pi}}$	$\frac{ad}{bc}$	$r_{\cos\text{-pi}}$
1.013	.005†	1.940	.255	4.067	.505	11.512	.755
1.039	.015	1.993	.265	4.205	.515	12.177	.765
1.066	.025	2.048	.275	4.351	.525	12.906	.775
1.093	.035	2.105	.285	4.503	.535	13.702	.785
1.122	.045	2.164	.295	4.662	.545	14.592	.795
1.150	.055	2.225	.305	4.830	.555	15.573	.805
1.180	.065	2.288	.315	5.007	.565	16.670	.815
1.211	.075	2.353	.325	5.192	.575	17.900	.825
1.242	.085	2.421	.335	5.388	.585	19.288	.835
1.275	.095	2.490	.345	5.595	.595	20.866	.845

1.697	.205	3.460	.455	8.910	.705	.88.984	.955
1.743	.215	3.571	.465	9.351	.715	117.52	.965
1.790	.225	3.690	.475	9.828	.725	169.60	.975
1.838	.235	3.808	.485	10.344	.735	293.28	.985
1.888	.245	3.935	.495	10.903	.745	934.06	.995

\*Based upon a more detailed tabulation of the same values by Perry, N. C., Kettner, N. W., Hertzka, A. F., and Bouvier, E. A. Estimating the tetrachoric correlation coefficient via a cosine-pi table. Technical Memorandum No. 2. Los Angeles: University of Southern California, 1953.

†Example: If an obtained ratio  $ad/bc$  equals 3.472, we find that this value lies between tabled values of 3.460 and 3.571. The cosine-pi coefficient is therefore between .455 and .465; that is to say, it is .46. If  $bc$  is greater than  $ad$ , find the ratio  $bc/ad$  and attach a negative sign to  $r_{\cos\text{-pi}}$ .

## RANDOM NUMBERS

## 200 RANDOM NORMAL DEVIATES

## 2.9.110

Row headings range from 00 through 19 at intervals of 1; ten deviates per row, each deviate being of the form  $\pm x.xx$ ; 2 pages.

00	-0.56	+1.51	-0.35	-0.51	-0.27	+0.24	+0.13	+2.10	-0.28	-0.98
01	-0.55	+0.91	-0.55	+1.82	+0.03	+1.26	-1.27	-0.90	-0.77	+0.88
02	+0.74	-1.33	+0.19	-0.33	-0.86	-1.39	+0.07	+0.35	+0.46	-0.24
03	+2.56	-0.11	+1.37	-0.86	-0.40	+0.10	+0.13	-0.32	+2.00	+0.32
04	-1.29	-0.02	+0.17	+1.14	-2.00	-0.19	-0.38	+0.88	-0.34	-0.62
15	-0.41	+0.56	-0.22	-0.45	-0.09	+1.20	-0.81	-0.42	+0.70	-0.71
16	+0.03	-1.77	-0.52	-0.41	+1.87	-0.19	-1.66	-0.31	+1.27	+0.55
17	+1.41	-0.51	-0.21	-0.86	-0.01	+0.87	+0.58	+0.48	-0.02	+0.11
18	-0.54	-0.10	-0.52	-0.76	+1.53	-1.07	-0.67	+0.70	-1.17	+0.54
19	+1.23	+0.31	-1.97	+0.81	-0.78	+0.52	-2.33	+1.30	+0.51	+2.02

## RANDOM NORMAL NUMBERS

## 2.9.190

5000 random normal numbers arranged in 100 columns with 50 entries per column; each normal number is of the form  $x.xxx$ ; minus signs are explicit, plus signs are omitted; 80 pages.

01	02	03	04	05	06	07	08	09	10
0.464	0.137	2.455	-0.323	-0.068	0.296	-0.288	1.298	0.241	-0.957
0.060	-2.526	-0.531	-0.194	-0.543	-1.558	0.187	-1.190	0.022	0.525
1.486	-0.354	-0.634	0.697	0.926	1.375	0.785	-0.963	-0.853	-1.865
1.022	-0.472	1.279	3.521	0.571	-1.851	0.194	1.192	-0.501	-0.273
1.394	-0.555	0.046	0.321	2.945	1.974	-0.258	0.412	0.439	-0.035
0.906	-0.513	-0.525	0.595	0.881	-0.934	1.579	0.161	-1.885	0.371
1.179	-1.055	0.007	0.769	0.971	0.712	1.090	-0.631	-0.255	-0.702
-1.501	-0.488	-0.162	-0.136	1.033	0.203	0.448	0.748	-0.423	-0.432
-0.690	0.756	-1.618	-0.345	-0.511	-2.051	-0.457	-0.218	0.857	-0.465
1.372	0.225	0.378	0.761	0.181	-0.736	0.960	-1.530	-0.260	0.120
0.190	-1.020	-1.104	0.936	-0.029	-1.004	-0.657	1.270	-0.060	-0.809
0.879	-0.642	1.155	-0.523	-0.757	-1.027	0.985	-1.222	1.078	0.163
0.559	1.094	1.587	-0.384	-1.701	0.418	0.327	0.669	0.019	0.782
-0.261	1.234	-0.505	-0.664	-0.446	-0.747	0.427	-0.369	0.089	-1.302
3.136	1.120	-0.591	2.515	-2.853	1.375	2.421	0.672	1.817	-0.067
-1.307	-0.586	-0.311	-0.026	1.633	-1.340	-1.209	0.110	-0.126	-0.288
1.455	1.099	-1.225	-0.817	0.667	-0.212	0.684	0.349	-1.161	-2.432
-0.443	-0.415	-0.660	0.098	0.435	-0.846	-0.375	-0.410	-1.747	-0.790
-0.326	0.798	0.349	0.524	0.690	-0.520	-0.522	0.602	-0.193	-0.535
-1.027	-1.459	-0.840	-1.637	-0.462	0.607	-0.760	1.342	-1.916	0.424

## 1000 RANDOM DIGITS

## 2.9.905

Row headings range from 00 through 19 at intervals of 1; 10 entries per row; 5 digits per entry; 2 pages.

00	49487	52802	28667	62058	87822	14704	18519	17889	45869	14454
01	29480	91539	46317	84803	86056	62812	33584	70391	77749	64906
02	25252	97738	23901	11106	86864	55808	22557	23214	15021	54268
03	02431	42193	96960	19620	29188	05863	92900	06836	13433	21709
04	69414	89353	70724	67893	23218	72452	03095	68333	13751	37260
15	40338	42477	78804	36272	72053	07958	67158	60979	79891	92409
16	54040	71253	88789	98203	54999	96564	00789	68879	47134	83941
17	49158	20908	44859	29089	76130	51442	34453	98590	37353	61137
18	80958	03808	83655	18415	96563	43582	82207	53322	30419	64435
19	07636	04876	61063	57571	69434	14965	20911	73162	33576	52839

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## RANDOM NUMBERS

## 2.9.910

2000 random digits; 5 digits per entry; 4 pages.

55034	81217	90564	81943	11241	84512	12288	89862	00760	76159
25521	99536	43233	48786	49221	06960	31564	21458	88199	06312
85421	72744	97242	66383	00132	05661	96442	37388	57671	27916
61219	48390	47344	30413	39392	91365	56203	79204	05330	31196
20230	03147	58854	11650	28415	12821	58931	30508	65989	26675
95776	83206	56144	55953	89787	64426	08448	45707	80364	60262
07603	17344	01148	83300	96955	65027	31713	89013	79557	49755
00645	17459	78742	39005	36027	98807	72666	54484	68262	38827
62950	83162	61504	31557	80590	47893	72360	72720	08396	33674
79350	10276	81933	26347	08068	67816	06659	87917	74166	85519
98170	25384	03841	23920	47954	10359	70114	11177	63298	99903
02670	86155	56860	02592	01646	42200	79950	37764	82341	71952
36934	42879	81637	79952	07066	41625	96804	92388	88860	68550
56851	12778	24309	73660	84264	24668	16686	02239	66022	64188
05464	28892	14271	23778	88599	17081	33884	88783	39015	57118
15025	20237	63386	71122	06620	07415	94982	32324	79427	70387
95610	08030	81469	91066	88857	56583	01224	28097	19726	71465
09026	40378	05731	55128	74298	49196	31669	42605	30363	96424
81431	99955	52462	67667	97322	69808	21240	65921	12629	92896
21431	59335	58627	94822	65484	09641	41018	85100	16110	82077

Compiled from Rand Corporation, A MILLION RANDOM DIGITS WITH 100,000 NORMAL DEVIATES. The Free Press, Glencoe, Ill., 1955 (with permission).

## RANDOM NUMBERS

2.9.918

4000 random digits; 5 digits per entry; 7 pages.

02946	96520	81881	56247	17623	47441	27821	91845
85697	62000	87957	07258	45054	58410	92081	97624
26734	68426	52067	23123	73700	58730	06111	64486
47829	32353	95941	72169	58374	03905	06865	95353
76603	99339	40571	41186	04981	17531	97372	39558
47526	26522	11045	83565	45639	02485	43905	01823
70100	85732	19741	92951	98832	38188	24080	24519
66819	50200	50889	06493	66638	03619	90906	95370
41614	30074	23403	03656	77580	87772	86877	57085
17930	26194	53836	53692	67125	98175	00912	11246

82810	18981	62581	31642	42693	78972	60322	90462
74772	80840	05816	29023	67410	12916	87933	78840
52931	38199	85632	23761	99084	48028	07184	41635
95395	87644	09722	99251	97129	70847	91864	08549
76695	33451	57139	90612	11918	90871	60965	23555
83560	50374	04410	57272	36705	51302	93147	29479
28355	62002	85994	35807	84810	14186	51153	78998
84684	54861	41330	66803	65231	14168	45193	27156
21135	92001	43896	55887	35319	03793	60344	95970
24236	01536	43897	41294	45551	46877	53631	82654

## RANDOM DIGITS

2.9.920

4400 random digits; 5 digits per entry; 8 pages.

15051	20470	19502	94699	95147	52871	99244	81393	78603	18726	94585
80381	48101	83920	04613	73055	19133	47150	61227	77218	40008	39924
29141	33085	91842	26565	05879	37284	88568	04208	21778	88357	76929
02799	39990	37655	36482	85097	56476	64346	79595	46675	00011	80407
51449	15917	32184	30629	30039	54019	47393	92614	26171	54992	72852
76779	83463	45656	68585	26352	78347	85647	27430	17373	20066	67412
75037	58096	50677	16209	69869	91985	45048	90111	03200	91720	10861
80001	99118	65191	88610	09578	14524	52501	51600	35350	39129	26566
05951	46640	95459	93114	90594	65581	38851	90685	77273	47120	57455
90633	70543	79018	72234	97123	07775	81845	36963	47133	59148	08987

41941	89380	08931	31059	85574	18041	06181	76284	19611	08901	14277
20653	43140	43952	48713	62861	88059	38596	57794	34420	19083	40649
22641	99650	33736	30839	57184	55685	62355	22707	08167	32474	69091
62806	55146	92775	46905	29702	10490	32160	27574	35972	19380	79014
71684	26208	59811	94533	73636	78013	42588	72726	60642	01802	11329
40417	92728	40803	42467	57239	62730	71057	45246	15630	90298	01417
61720	40876	51896	73549	66760	91022	20798	61931	68047	56962	27092
73854	06073	62393	27678	49420	54146	63824	12268	61546	18385	50577
03388	15960	37720	44788	56374	51201	83595	01399	59377	38624	61467
08174	33360	82394	07804	85683	32097	19190	93088	87312	42177	19701

## RANDOM DIGITS

2.9.925

5000 random digits; 5 digits per entry; 9 pages.

03991	10461	93716	16894	98953	73231	39528	72484	82474	25593
38555	95554	32886	59780	09958	18063	81616	18711	53342	44276
17546	73704	92052	46215	15917	06253	07586	16120	82641	22820
32643	52861	95819	06831	19640	99413	90767	04235	13574	17206
69572	68777	39510	35905	85244	35159	40188	28193	29593	88627
24122	66591	27699	06494	03152	19121	34414	82157	86887	55087
61196	30231	92962	61773	22109	78508	63439	73363	44989	16822
30532	21704	10274	12202	94205	20390	67049	09070	93399	45547
03788	97599	75867	20717	82037	10268	79495	04146	52162	90286
48228	63379	85783	47619	87481	37220	91704	30552	04737	21031

12470	56500	50273	93113	41794	86861	39448	93136	25722	08564
01016	00857	41398	80504	90670	08289	58137	17820	22751	36518
34030	60726	25807	24260	71529	78920	47648	13885	70669	93406
50259	46345	06170	97965	88302	98041	11947	56203	19324	20504
73959	76145	60808	54444	74412	81105	69181	96845	38525	11606
46874	37088	80940	44893	10408	36222	14004	23153	69249	05747
60883	52109	19516	90120	46759	71643	62342	07589	08899	05988

## RANDOM NUMBERS

2.9.930

7000 random digits; 5 digits per entry; 12 pages.

04438	80674	24520	18222	10610	05794	37515
60298	47829	72648	37414	75755	04717	29899
67884	59651	67533	68123	17730	95862	08034
89512	32155	51906	61662	64130	16688	37275
32653	01895	12506	88535	36553	23757	34209
95913	15405	13772	76638	48423	25018	99041
55864	21694	13122	44115	01601	50541	00147
25334	49810	91601	40617	72876	23967	73830
57729	32196	76487	11622	96297	24160	09903
86648	13697	63677	70119	94739	25875	38829

11861	69032	51915	23510	32050	52052	24004
67699	01009	07050	73324	06732	27510	33761
50064	29500	17450	18030	63124	48061	59412
93126	17700	94400	76075	08317	27324	72723
01657	92602	41043	05686	15650	29970	95877
12800	76690	75133	60456	28491	03845	11507
98135	42870	48578	29036	69878	86563	61729
08313	99293	00990	13595	77457	79969	11339
90974	83965	62732	85161	54330	22406	86253
33273	61993	88407	69399	17301	70975	99129

\* Based on parts of *Table of 105,000 Random Decimal Digits*, Interstate Commerce Commission, Bureau of Transport Economics and Statistics, Washington, D.C.

## RANDOM NUMBERS

2.9.935

5000 random digits; 2 digits per entry; 13 pages.

22 17 68 05 84	68 95 23 92 35	87 02 22 57 51	61 09 43 95 06	58 24 82 03 47
19 36 27 59 46	13 79 93 37 55	39 77 32 77 09	85 52 05 30 62	47 23 51 62 74
16 77 23 02 77	09 61 87 25 21	28 06 24 25 93	16 71 13 59 78	23 05 47 47 25
78 43 76 71 61	20 44 90 32 64	97 67 63 99 61	46 38 03 93 22	69 81 21 99 21
03 28 28 26 08	73 37 32 04 05	69 30 16 09 05	88 69 58 28 99	35 07 44 75 47
93 22 53 64 39	07 10 63 76 35	87 03 04 79 88	08 13 13 85 51	55 34 57 72 69
78 76 58 54 74	93 38 70 96 92	52 06 79 79 45	82 63 18 27 44	69 66 92 19 09
23 68 35 26 00	99 53 93 61 28	52 70 05 48 34	56 65 05 61 86	90 92 10 70 80
15 39 25 70 99	93 86 52 77 65	15 33 59 05 28	22 87 26 07 47	86 96 98 29 06
58 71 96 30 24	18 46 23 34 27	85 13 99 24 44	49 18 09 79 49	74 16 32 23 02

78 83 19 76 16	94 11 68 84 26	23 54 20 86 85	23 86 66 99 07	36 37 34 92 09
87 76 59 61 81	43 63 64 61 61	65 76 36 95 90	18 48 27 45 68	27 23 65 30 72
91 43 05 96 47	55 78 99 95 24	37 55 85 78 78	01 48 41 19 10	35 19 54 07 73
84 97 77 72 73	09 62 06 65 72	87 12 49 03 60	41 15 20 76 27	50 47 02 29 16
87 41 60 76 83	44 88 96 07 80	83 05 83 38 96	73 70 66 81 90	30 56 10 48 50

Source: Table J is taken from Table XXXIII of Fisher and Yates, *Statistical Tables for Biological, Agricultural and Medical Research*, published by Oliver and Boyd, Ltd., Edinburgh, and by permission of the authors and publishers.

## RANDOM NUMBERS

2.9.950

Table is in five sections with 1000 random digits per section; in each section the row headings range from 0 through 24; eight columns each with a double heading as follows:

00000	00000	11111	11111	22222	22222	33333	33333
01234	56789	01234	56789	01234	56789	01234	56789

20 pages.

Row	COLUMN NUMBER							
	00000 01234	00000 56789	11111 01234	11111 56789	22222 01234	22222 56789	33333 01234	33333 56789
1st Thousand								
00	23157	54859	01837	25993	76249	70886	95230	36744
01	05545	55043	10537	43508	90611	83744	10962	21343
02	14871	60350	32404	36223	50051	00322	11543	80834
03	3876	74051	98751	7573	78805	00194	32429	7699

Row	COLUMN NUMBER							
	00000 01234	00000 56789	11111 01234	11111 56789	22222 01234	22222 56789	33333 01234	33333 56789
5th Thousand								
00	29935	06971	63175	52579	10478	89379	61428	21363
01	15114	07126	51890	77787	75510	13103	42942	48111
02	03870	43225	10589	87629	22039	94124	38127	65022
03	79390	39188	40756	45269	65959	20640	14284	22960

22	18630	53263	13319	97619	35859	12350	14632	87659
23	89673	38230	16063	92007	59503	38402	76450	33333
24	62986	67364	06595	17427	84623	14565	82860	57300

\* This table is reproduced from M. G. Kendall and B. B. Smith, "Randomness and Random Sampling Numbers," *Journal of the Royal Statistical Society*, 101 (1938), pp. 164-166, by permission of the Royal Statistical Society and the authors.

## RANDOM NUMBERS

## 2.9.951

Row headings under Line range from 1 through 100 at intervals of 1; under Column are subheadings (1) through (14) at intervals of 1; entries are random digits in groups of 5; 21 pages.

A TABLE OF 14,000 RANDOM UNITS

Line/Col.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1	10480	15011	01536	02011	81647	91646	69179	14194	62590	36207	20969	99570	91291	90700
2	22368	46573	25595	85393	30995	89198	27982	53402	93965	34095	52666	19174	39615	99503
3	24130	48360	22527	97265	76393	64809	15179	24830	49340	32081	30680	19655	63348	58629
4	42167	93093	06243	61680	07856	16376	39440	53537	71341	57004	00849	74917	97758	16379
5	37570	39975	81837	16656	06121	91782	60468	81305	49684	60672	14110	06927	01263	54613

96	42488	78077	69882	61657	34136	79180	97526	43092	04098	73571	80799	76536	71255	64239
97	46764	86273	63003	93017	31204	36692	40202	35275	57306	55543	53203	18098	47625	88684
98	03237	45430	55417	63282	90816	17349	88298	90183	36600	78406	06216	95787	42579	90730
99	86591	81482	52667	61583	14972	90053	89534	76036	49199	43716	97548	04379	46370	28672
100	38534	01715	94964	87288	65680	43772	39560	12918	86537	62738	19636	51132	25739	56947

## RANDOM NUMBERS

## 2.9.975

6400 random digits in eight sections, I through VIII; row headings in each section range from 1 through 25 at intervals of 1; column headings are: 1-4, 5-8, 9-12, 13-16, 17-20, 21-24, 25-28, 29-32; each entry consists of four random digits grouped by twos; 32 pages.

L	1-4	5-8	9-12	13-16	17-20	21-24	25-28	29-32
1	74 44	80 91	21 41	40 25	98 81	57 12	30 13	24 93
2	72 59	62 28	26 74	90 62	91 20	70 31	19 10	23 06
3	33 76	63 60	48 79	23 76	28 61	87 65	79 30	38 27
4	78 02	65 54	17 61	60 15	00 81	18 07	66 38	88 33
5	32 46	64 91	77 63	26 35	94 81	54 90	10 70	10 66
6	19 68	47 39	30 75	39 71	13 14	55 59	25 38	79 00

VIII.	1	55 75	40 42	28 16	15 56	85 90	22 52	87 75	06 06
2	53 93	89 69	57 62	00 50	26 55	37 24	65 06	64 78	
3	84 57	05 82	38 34	07 71	97 01	91 60	45 25	33 38	
4	03 05	40 70	93 45	19 14	58 44	31 03	79 85	07 37	
5	65 05	52 06	67 02	47 03	67 69	07 49	67 57	91 35	

21	77 63	69 24	66 53	10 06	53 68	30 75	58 69	66 09
22	60 36	08 06	17 43	89 37	19 21	29 61	41 54	17 80
23	72 25	43 32	87 36	99 15	39 77	47 45	28 97	90 13
24	82 42	03 82	40 22	17 69	64 42	39 68	44 19	83 56
25	41 38	49 33	89 76	67 76	87 32	94 70	01 81	90 14

## REGRESSION AND LEAST SQUARES

SIGNIFICANCE POINTS OF  $d_L$  AND  $d_U$ : 1%

## 2.10.11

Row headings under  $n$  range from 15 through 40 at intervals of 1, and from 40 through 100 at intervals of 5; column headings are:  $k' = 1, k' = 2, k' = 3, k' = 4, k' = 5$ ; each column has two sub-headings:  $d_L, d_U$ ; entries are of the form  $x.xx$ ; short note accompanies table; 7 pages.

$n$	$k' = 1$		$k' = 2$		$k' = 3$		$k' = 4$		$k' = 5$	
	$d_L$	$d_U$								
15	0.81	1.07	0.70	1.25	0.59	1.46	0.49	1.70	0.39	1.96
16	0.84	1.09	0.74	1.25	0.63	1.44	0.53	1.66	0.44	1.90
17	0.87	1.10	0.77	1.25	0.67	1.43	0.57	1.63	0.48	1.85
18	0.90	1.12	0.80	1.26	0.71	1.42	0.61	1.60	0.52	1.80
19	0.93	1.13	0.83	1.26	0.74	1.41	0.65	1.58	0.56	1.77
20	0.95	1.15	0.86	1.27	0.77	1.41	0.68	1.57	0.60	1.74
37	1.22	1.32	1.16	1.38	1.11	1.45	1.06	1.51	1.00	1.59
38	1.23	1.33	1.18	1.39	1.12	1.45	1.07	1.52	1.02	1.58
39	1.24	1.34	1.19	1.39	1.14	1.45	1.09	1.52	1.03	1.58
40	1.25	1.34	1.20	1.40	1.15	1.46	1.10	1.52	1.05	1.58
45	1.29	1.38	1.24	1.42	1.20	1.48	1.16	1.53	1.11	1.58
50	1.32	1.40	1.28	1.45	1.24	1.49	1.20	1.54	1.16	1.59
80	1.47	1.52	1.44	1.54	1.42	1.57	1.39	1.60	1.36	1.62
85	1.48	1.53	1.46	1.55	1.43	1.58	1.41	1.60	1.39	1.63
90	1.50	1.54	1.47	1.56	1.45	1.59	1.43	1.61	1.41	1.64
95	1.51	1.55	1.49	1.57	1.47	1.60	1.45	1.62	1.42	1.64
100	1.52	1.56	1.50	1.58	1.48	1.60	1.46	1.63	1.44	1.65

Note:  $k'$  = number of explanatory variables excluding the constant term.

Source: J. Durbin and G. S. Watson, "Testing for Serial Correlation in Least Squares Regression," *Biometrika*, Vol. 38, 1951, pp. 159-177.

SIGNIFICANCE POINTS OF  $d_L$  AND  $d_U$ : 2.5%

## 2.10.125

Row headings under  $n$  range from 15 through 40 at intervals of 1, and from 40 through 100 at intervals of 5; column headings are:  $k' = 1, k' = 2, k' = 3, k' = 4, k' = 5$ ; each column has two sub-headings:  $d_L, d_U$ ; entries are of the form x.xx; short note accompanies table: 7 pages.

$n$	$k' = 1$		$k' = 2$		$k' = 3$		$k' = 4$		$k' = 5$	
	$d_L$	$d_U$								
15	0.95	1.23	0.83	1.40	0.71	1.61	0.59	1.84	0.48	2.09
16	0.98	1.24	0.86	1.40	0.75	1.59	0.64	1.80	0.53	2.03
17	1.01	1.25	0.90	1.40	0.79	1.58	0.68	1.77	0.57	1.98
18	1.03	1.26	0.93	1.40	0.82	1.56	0.72	1.74	0.62	1.93
19	1.06	1.28	0.96	1.41	0.86	1.55	0.76	1.72	0.66	1.90
80	1.54	1.59	1.52	1.62	1.49	1.65	1.47	1.67	1.44	1.70
85	1.56	1.60	1.53	1.63	1.51	1.65	1.49	1.68	1.46	1.71
90	1.57	1.61	1.55	1.64	1.53	1.66	1.50	1.69	1.48	1.71
95	1.58	1.62	1.56	1.65	1.54	1.67	1.52	1.69	1.50	1.71
100	1.59	1.63	1.57	1.65	1.55	1.67	1.53	1.70	1.51	1.72

Note:  $k'$  = number of explanatory variables excluding the constant term.

SIGNIFICANCE POINTS OF  $d_L$  AND  $d_U$ : 5%

## 2.10.15

Row headings under  $n$  range from 15 through 40 at intervals of 1, and from 40 through 100 at intervals of 5; column headings are:  $k' = 1, k' = 2, k' = 3, k' = 4, k' = 5$ ; each column has two sub-headings:  $d_L, d_U$ ; entries are of the form x.xx; short note accompanies table: 7 pages.

$n$	$k' = 1$		$k' = 2$		$k' = 3$		$k' = 4$		$k' = 5$	
	$d_L$	$d_U$								
15	1.08	1.36	0.95	1.54	0.82	1.75	0.69	1.97	0.56	2.21
16	1.10	1.37	0.98	1.54	0.86	1.73	0.74	1.93	0.62	2.15
17	1.13	1.38	1.02	1.54	0.90	1.71	0.78	1.90	0.67	2.10
18	1.16	1.39	1.05	1.53	0.93	1.69	0.82	1.87	0.71	2.06
19	1.18	1.40	1.08	1.53	0.97	1.68	0.86	1.85	0.75	2.02
85	1.62	1.67	1.60	1.70	1.57	1.72	1.55	1.75	1.52	1.77
90	1.63	1.68	1.61	1.70	1.59	1.73	1.57	1.75	1.54	1.78
95	1.64	1.69	1.62	1.71	1.60	1.73	1.58	1.75	1.56	1.78
100	1.65	1.69	1.63	1.72	1.61	1.74	1.59	1.76	1.57	1.78

Note:  $k'$  = number of explanatory variables excluding the constant term.

Source: J. Durbin and G. S. Watson, "Testing for Serial Correlation in Least Squares Regression," *Biometrika*, Vol. 38, 1951, pp. 159-177.

## COEFFICIENTS FOR ORTHOGONAL POLYNOMIALS

### 2.10.21

Column headings are:  $k$ , Polynomial,  $X$ , the last having subheadings 1 through 10 at intervals of 1; under heading  $k$  row headings range from 3 through 10, each of these standing for a group of polynomials, linear, quadratic, cubic, etc. listed under the heading Polynomial; entries under  $X$  are the coefficients to be used as the basis for comparison or analysis, and are one- and occasionally two-digit values; 3 pages.

$k$	Polynomial	$X = 1$	2	3	4	5	6	7	8	9	10
3	Linear	-1	0	1							
	Quadratic	1	-2	1							
4	Linear	-3	-1	1	3						
	Quadratic	1	-1	-1	1						
	Cubic	-1	3	-3	1						
5	Linear	-2	-1	0	1	2					
	Quadratic	2	-1	-2	-1	2					
	Cubic	-1	2	0	-2	1					
	Quartic	1	-4	6	-4	1					
9	Linear	-4	-3	-2	-1	0	1	2	3	4	
	Quadratic	28	7	-8	-17	-20	-17	-8	7	28	
	Cubic	-14	7	13	9	0	-9	-13	-7	14	
	Quartic	14	-21	-11	9	18	9	-11	-21	14	
	Quintic	-4	11	-4	-9	0	9	4	-11	4	
10	Linear	-9	-7	-5	-3	-1	1	3	5	7	9
	Quadratic	6	2	-1	-3	-4	-4	-3	-1	2	6
	Cubic	-42	14	35	31	12	-12	-31	-35	-14	42
	Quartic	18	-22	-17	3	18	18	3	-17	-22	18
	Quintic	-6	14	-1	-11	-6	6	11	1	-14	6

SOURCE: Abridged from Table B.10 of *Statistical Principles in Experimental Design* by B. J. Winer. Copyright 1962 by McGraw-Hill Book Company. Used by permission of McGraw-Hill Book Company.

### Coefficients for Orthogonal Polynomials

In this table, the column headed by  $k$  indicates the number of components being compared. The columns headed by the ten  $X$  values indicate the actual coefficients to be used. Thus, if  $k = 3$  groups were being analyzed, the coefficients for analysis of the linear component would be -1 for Group 1, 0 for Group 2, and 1 for Group 3. The quadratic coefficients would be 1, -2, and 1 for the three respective groups.

## COEFFICIENTS OF ORTHOGONAL POLYNOMIALS

## 2.10.22

Table contains thirteen sections, each having a main column heading,  $J = 3$  (for first section) through  $J = 15$  (for last); sub-column headings are numerical and start with 1, increasing to 5 at intervals of 1 for the first four sections, while 1 through 6 applies to the balance; row headings in leftmost column (no heading) are:  $X_1, X_2, X_3, \dots$ , exponents of  $X$  increasing sequentially to correspond to the value of  $J$ ; a final row heading ends each section of the table,  $\Sigma c_j^2$ ; some entries are listed as negative values; 12 pages.

 $J = 3$  $J = 4$  $J = 5$ 

	1	2		1	2	3		1	2	3	4
$X_1$	-1	1		-3	1	-1		-2	2	-1	1
$X_2$	0	-2		-1	-1	3		-1	-1	2	-4
$X_3$	1	1		1	-1	-3		0	-2	0	6
$X_4$				3	1	1		1	-1	-2	-4
$X_5$								2	2	1	1
$\Sigma c_j^2$	2	6		20	4	20		10	14	10	70

 $J = 6$  $J = 7$ 

	1	2	3	4	5		1	2	3	4	5	6
$X_1$	-5	5	-5	1	-1		-3	5	-1	3	-1	1

 $J = 8$  $J = 13$ 

	1	2	3	4	5	6		1	2	3	4	5	6
	-	-	-	-	-	-		-	-	-	-	-	-

 $J = 14$  $J = 15$ 

	1	2	3	4	5	6		1	2	3	4	5	6
$X_1$	-13	13	-143	143	-143	143		-7	91	-91	1001	-1001	143
$X_2$	-11	7	-11	-77	187	-319		-6	52	-13	-429	1144	-286
$X_3$	-9	2	66	-132	132	-11		-5	10	-35	-869	979	-55

$X_{12}$	9	2	-66	-132	-132	-11		4	-8	-58	-704	-44	176
$X_{13}$	11	7	11	-77	-187	-319		5	19	-35	-869	-979	-55
$X_{14}$	13	13	143	143	143	143		6	52	13	-429	-1144	-286
$X_{15}$								7	91	91	1001	1001	143
$\Sigma c_j^2$	910	728	97240	136136	235144	497420		280	37128	39780	6446460	10581480	426360

RANGES  
DUNCAN'S MULTIPLE RANGE .10  
2.11.D1

Column headings (k) range from 2 through 19 at intervals of 1; rows (degrees of freedom) range from 2 through 20 at intervals of 1, as well as 24, 30, 40, 60, 120,  $\infty$ ; each entry contains four significant digits; 5 pages.

.10

$k \backslash df$	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
2	4.130																	
3	3.328	3.330																
4	3.015	3.074	3.081															
5	2.850	2.934	2.964	2.970														
6	2.748	2.846	2.890	2.903	2.911													
7	2.680	2.785	2.838	2.864	2.876	2.878												
11	2.540	2.660	2.730	2.772	2.799	2.817	2.827	2.833	2.835	2.835								
12	2.521	2.643	2.714	2.759	2.789	2.808	2.821	2.828	2.832	2.833	2.833							
13	2.505	2.628	2.691	2.748	2.779	2.800	2.815	2.824	2.829	2.832	2.832	2.832						
14	2.491	2.616	2.690	2.739	2.771	2.794	2.810	2.820	2.827	2.831	2.832	2.833	2.833					
15	2.479	2.605	2.681	2.731	2.765	2.789	2.805	2.817	2.825	2.830	2.833	2.834	2.834	2.834				
16	2.469	2.596	2.673	2.723	2.759	2.784	2.802	2.815	2.824	2.830	2.833	2.836	2.836	2.836				
17	2.460	2.588	2.665	2.717	2.753	2.780	2.798	2.812	2.822	2.829	2.834	2.836	2.836	2.838	2.838			
18	2.452	2.580	2.659	2.712	2.749	2.776	2.796	2.810	2.821	2.828	2.834	2.838	2.840	2.840	2.840	2.840		
19	2.445	2.574	2.653	2.707	2.745	2.773	2.793	2.808	2.820	2.828	2.834	2.839	2.841	2.842	2.843	2.843	2.843	
20	2.439	2.568	2.648	2.702	2.741	2.770	2.791	2.807	2.819	2.828	2.834	2.839	2.843	2.845	2.845	2.845	2.845	
24	2.420	2.550	2.632	2.688	2.729	2.760	2.783	2.801	2.816	2.827	2.835	2.842	2.851	2.854	2.856	2.857	2.857	
30	2.400	2.532	2.615	2.674	2.717	2.750	2.776	2.796	2.813	2.826	2.837	2.846	2.853	2.859	2.863	2.867	2.869	
40	2.381	2.514	2.600	2.660	2.705	2.741	2.769	2.791	2.810	2.825	2.838	2.849	2.858	2.866	2.873	2.878	2.883	
60	2.363	2.497	2.584	2.646	2.694	2.731	2.761	2.786	2.807	2.825	2.839	2.853	2.864	2.874	2.883	2.897	2.903	
120	2.344	2.479	2.568	2.632	2.682	2.722	2.754	2.781	2.804	2.824	2.857	2.871	2.883	2.893	2.903	2.912	2.920	
$\infty$	2.326	2.462	2.552	2.619	2.670	2.712	2.746	2.776	2.801	2.824	2.844	2.861	2.877	2.892	2.905	2.918	2.929	2.939

SOURCE: The entries in this table were tabulated and made available by H. Leon Harter of the Aerospace Research Laboratories, Office of Aerospace Research, U.S. Air Force.

## DUNCAN'S MULTIPLE RANGE .05

2.11.D2

Column headings (k) range from 2 through 19 at intervals of 1; row headings (degrees of freedom) range from 2 through 20 at intervals of 1; also 24, 30, 40, 60, 120,  $\infty$ ; each entry contains four significant figures; 5 pages.

$k \backslash d_f$	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
2	6.056																	
3	4.501	4.616																
4	3.927	4.013	4.033															
5	3.635	3.749	3.797	3.814														
6	3.461	3.587	3.649	3.680	3.694													
11	3.113	3.250	3.312	3.307	3.436	3.402	3.480	3.403	3.501	3.506								
12	3.082	3.225	3.313	3.370	3.410	3.450	3.474	3.484	3.491	3.496								
13	3.055	3.200	3.289	3.348	3.410	3.442	3.468	3.470	3.478	3.484	3.488							
14	3.033	3.178	3.268	3.320	3.372	3.403	3.420	3.444	3.457	3.467	3.474	3.479	3.482					
15	3.014	3.160	3.250	3.312	3.356	3.380	3.413	3.432	3.446	3.457	3.465	3.471	3.476	3.478				
16	2.998	3.144	3.235	3.298	3.343	3.376	3.402	3.422	3.437	3.449	3.465	3.470	3.473	3.477				
17	2.984	3.130	3.222	3.285	3.331	3.366	3.392	3.412	3.429	3.441	3.451	3.459	3.465	3.469	3.473	3.475		
18	2.971	3.118	3.210	3.274	3.321	3.356	3.383	3.405	3.421	3.435	3.445	3.454	3.460	3.465	3.470	3.472	3.474	
19	2.960	3.107	3.199	3.264	3.311	3.347	3.375	3.397	3.415	3.429	3.440	3.449	3.456	3.462	3.467	3.470	3.472	3.473
20	2.950	3.097	3.190	3.255	3.303	3.339	3.368	3.391	3.409	3.424	3.436	3.445	3.453	3.459	3.464	3.467	3.470	3.473
24	2.919	3.068	3.160	3.226	3.276	3.315	3.345	3.370	3.390	3.406	3.420	3.432	3.441	3.449	3.456	3.461	3.465	3.469
30	2.888	3.035	3.131	3.199	3.250	3.290	3.322	3.349	3.371	3.389	3.405	3.418	3.430	3.439	3.447	3.454	3.460	3.466
40	2.858	3.006	3.102	3.171	3.224	3.263	3.300	3.328	3.352	3.373	3.390	3.405	3.418	3.429	3.438	3.446	3.453	3.463
60	2.829	2.976	3.073	3.143	3.198	3.241	3.277	3.307	3.333	3.355	3.374	3.391	3.406	3.419	3.431	3.442	3.451	3.460
120	2.800	2.947	3.045	3.116	3.172	3.217	3.254	3.287	3.314	3.337	3.359	3.377	3.394	3.409	3.423	3.435	3.446	3.457
•	2.772	2.918	3.017	3.089	3.146	3.193	3.232	3.265	3.294	3.320	3.343	3.363	3.382	3.399	3.414	3.428	3.442	3.454

Column headings (*k*) range from 2 through 19 at intervals of 1; row headings (degrees of freedom range from 2 through 20 at intervals of 1, also 24, 30, 40, 60, 120,  $\infty$ ; each entry contains four significant figures; 5 pages.

.01

<i>k</i>	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
<i>df</i>	2	14.04																
11	4.392	4.579	4.697	4.780	4.841	4.887	4.924	4.952	4.975	4.994								
12	4.320	4.504	4.622	4.706	4.767	4.815	4.852	4.883	4.907	4.927	4.944							
13	4.260	4.442	4.560	4.844	4.706	4.755	4.793	4.824	4.850	4.872	4.889	4.904						
14	4.210	4.391	4.508	4.591	4.654	4.704	4.743	4.775	4.802	4.824	4.843	4.859	4.872					
15	4.168	4.347	4.463	4.547	4.610	4.660	4.700	4.733	4.760	4.783	4.803	4.820	4.834	4.846				
16	4.131	4.309	4.425	4.509	4.572	4.622	4.663	4.696	4.724	4.748	4.768	4.786	4.800	4.813	4.825			
17	4.099	4.275	4.391	4.475	4.539	4.589	4.630	4.664	4.693	4.717	4.738	4.756	4.771	4.785	4.797	4.807		
18	4.071	4.246	4.362	4.445	4.509	4.560	4.601	4.635	4.664	4.689	4.711	4.729	4.745	4.759	4.772	4.783	4.792	
19	4.046	4.220	4.335	4.419	4.483	4.534	4.575	4.610	4.639	4.665	4.686	4.705	4.722	4.736	4.749	4.761	4.771	4.780
20	4.024	4.197	4.312	4.395	4.459	4.510	4.652	4.687	4.617	4.642	4.664	4.684	4.701	4.716	4.729	4.741	4.751	4.761
24	3.958	4.126	4.239	4.322	4.386	4.437	4.480	4.516	4.546	4.573	4.596	4.616	4.634	4.651	4.665	4.678	4.690	4.700
30	3.889	4.056	4.168	4.250	4.314	4.366	4.409	4.445	4.477	4.504	4.528	4.550	4.569	4.586	4.601	4.615	4.628	4.640
40	3.825	3.988	4.098	4.180	4.244	4.296	4.339	4.376	4.408	4.436	4.461	4.483	4.503	4.521	4.537	4.553	4.566	4.579
60	3.762	3.922	4.031	4.111	4.174	4.226	4.270	4.307	4.340	4.368	4.394	4.417	4.438	4.456	4.474	4.493	4.504	4.518
120	3.702	3.858	3.965	4.044	4.107	4.158	4.202	4.239	4.272	4.301	4.327	4.351	4.372	4.392	4.410	4.426	4.442	4.456
•	3.643	3.796	3.900	3.978	4.040	4.091	4.135	4.172	4.205	4.235	4.261	4.286	4.307	4.327	4.345	4.363	4.379	4.394

## DUNCAN'S MULTIPLE RANGE .005

2.11.D4

Column headings (k) range from 2 through 19 at intervals of 1; row headings (degrees of freedom) range from 2 through 20 at intervals of 1, also 24, 30, 40, 60, 120,  $\infty$ ; each entry contains four significant figures; 5 pages.

<i>k</i>	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
<i>df</i>																			
2	19.93																		
3	10.55	10.63																	
4	7.916	8.126	8.210																
5	6.751	6.980	7.100	7.167															
6	6.105	6.334	6.466	6.547	6.800														
7	5.699	5.922	6.057	6.145	6.207	6.250													
11	4.015	5.140	5.280	5.372	5.442	5.400	5.530	5.574	5.603	5.626									
12	4.810	5.048	5.178	5.270	5.341	5.303	5.430	5.476	5.505	5.531	5.552								
13	4.770	4.900	5.004	5.180	5.250	5.312	5.350	5.393	5.424	5.450	5.472	5.492							
14	4.704	4.807	5.023	5.110	5.185	5.241	5.286	5.324	5.355	5.382	5.405	5.425	5.442						
15	4.647	4.838	4.904	5.055	5.125	5.181	5.226	5.264	5.297	5.324	5.348	5.368	5.386	5.402					
16	4.599	4.787	4.912	5.003	5.073	5.120	5.175	5.213	5.245	5.273	5.298	5.319	5.338	5.354	5.368				
17	4.557	4.744	4.867	4.958	5.027	5.084	5.130	5.168	5.201	5.229	5.254	5.276	5.296	5.311	5.327	5.340			
18	4.521	4.705	4.828	4.918	4.987	5.043	5.090	5.120	5.163	5.190	5.215	5.237	5.256	5.274	5.289	5.303	5.316		
19	4.488	4.671	4.793	4.883	4.952	5.008	5.054	5.093	5.127	5.156	5.181	5.203	5.222	5.240	5.256	5.270	5.283	5.295	
20	4.460	4.641	4.762	4.851	4.920	4.976	5.022	5.061	5.095	5.124	5.150	5.172	5.193	5.210	5.226	5.241	5.254	5.266	
24	4.371	4.547	4.666	4.753	4.822	4.877	4.924	4.963	4.997	5.027	5.053	5.076	5.097	5.116	5.133	5.148	5.162	5.176	
30	4.285	4.456	4.572	4.658	4.726	4.781	4.827	4.867	4.901	4.931	4.958	4.981	5.003	5.022	5.040	5.056	5.071	5.086	
40	4.202	4.309	4.482	4.566	4.632	4.687	4.733	4.772	4.806	4.837	4.864	4.888	4.910	4.930	4.948	4.965	4.980	4.995	
60	4.122	4.284	4.394	4.476	4.541	4.595	4.640	4.670	4.713	4.744	4.771	4.796	4.818	4.838	4.857	4.874	4.890	4.905	
120	4.045	4.201	4.308	4.388	4.452	4.505	4.550	4.588	4.622	4.052	4.670	4.704	4.726	4.747	4.766	4.784	4.800	4.815	
200	3.970	4.121	4.225	4.303	4.365	4.417	4.461	4.490	4.532	4.562	4.589	4.614	4.630	4.657	4.676	4.694	4.710	4.726	

## DUNCAN'S MULTIPLE RANGE .001

2.11.D5

DUNCAN'S MULTIPLE RANGE .001

2.11.D5

151

Column headings (k) range from 2 through 19 at intervals of 1; row headings (degrees of freedom) range from 2 through 20 at intervals of 1, then 24, 30, 40, 60, 120,  $\infty$ ; each entry contains four significant figures; 5 pages.

		.001																	
<i>k</i>	<i>df</i>	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
11	6.275	6.516	6.676	6.791	6.880	6.950	7.008	7.056	7.097	7.132									
12	6.106	6.340	6.494	6.607	6.695	6.765	6.822	6.870	6.911	6.947	6.978								
13	5.970	6.195	6.346	6.457	6.543	6.612	6.670	6.718	6.759	6.795	6.826	6.854							
14	5.836	6.076	6.223	6.332	6.416	6.485	6.542	6.590	6.631	6.667	6.699	6.727	6.752						
15	5.700	5.974	6.119	6.225	6.309	6.377	6.433	6.481	6.522	6.558	6.590	6.619	6.644	6.668					
16	5.678	5.888	6.030	6.135	6.217	6.284	6.340	6.388	6.429	6.465	6.497	6.525	6.551	6.574	6.595				
17	5.608	5.813	5.953	6.056	6.138	6.204	6.260	6.307	6.348	6.384	6.416	6.444	6.470	6.493	6.514	6.533			
18	5.546	5.748	5.886	5.988	6.068	6.134	6.189	6.236	6.277	6.313	6.345	6.373	6.399	6.422	6.443	6.462	6.480		
19	5.492	5.691	5.826	5.927	6.007	6.072	6.127	6.174	6.214	6.250	6.281	6.310	6.336	6.359	6.380	6.400	6.418	6.434	
20	5.444	5.640	5.774	5.873	5.952	6.017	6.071	6.117	6.153	6.193	6.225	6.254	6.279	6.303	6.324	6.344	6.362	6.379	
24	5.297	5.484	5.612	5.708	5.784	5.846	5.899	5.946	5.984	6.020	6.051	6.079	6.105	6.129	6.150	6.170	6.188	6.205	
30	5.156	5.335	5.457	5.649	5.692	5.734	5.778	5.817	5.851	5.882	5.910	5.935	5.958	5.980	6.000	6.018	6.036		
40	5.022	5.191	5.308	5.396	5.466	5.524	5.574	5.617	5.654	5.688	5.718	5.745	5.770	5.793	5.814	5.834	5.852	5.869	
60	4.894	5.055	5.166	5.249	5.317	5.372	5.420	5.461	5.498	5.530	5.559	5.586	5.610	5.632	5.653	5.672	5.690	5.707	
120	4.771	4.924	5.029	5.109	5.173	5.226	5.271	5.311	5.340	5.377	5.405	5.431	5.454	5.476	5.496	5.515	5.532	5.549	
=	4.654	4.798	4.898	4.974	5.034	5.085	5.128	5.166	5.199	5.229	5.256	5.280	5.303	5.324	5.343	5.361	5.378	5.394	

## UPPER 1 PERCENT POINTS OF THE STUDENTIZED RANGE

## 2.11.S01

Column headings under  $n$  range from 1 through 20 in intervals of 1; row headings under  $v$  (Greek  $n$ ) range from 1 through 20 at intervals of 1, then 24, 30, 40, 60, 120,  $\infty$ ; entries are tabulated to two decimal places; 8 pages.

$n \backslash v$	2	3	4	5	6	7	8	9	10
1	90.03	135.0	164.3	185.6	202.2	215.8	227.2	237.0	245.6
2	14.04	19.02	22.29	24.72	26.63	28.20	29.53	30.68	31.69
3	8.26	10.62	12.17	13.33	14.24	15.00	15.64	16.20	16.69
4	6.51	8.12	9.17	9.96	10.58	11.10	11.55	11.93	12.27
5	5.70	6.98	7.80	8.42	8.91	9.32	9.67	9.97	10.24

16	4.13	4.79	5.19	5.49	5.72	5.92	6.08	6.22	6.35
17	4.10	4.74	5.14	5.43	5.66	5.85	6.01	6.15	6.27
18	4.07	4.70	5.09	5.38	5.60	5.79	5.94	6.08	6.20
19	4.05	4.67	5.05	5.33	5.55	5.73	5.89	6.02	6.14
20	4.02	4.64	5.02	5.29	5.51	5.69	5.84	5.97	6.09
24	3.96	4.55	4.91	5.17	5.37	5.54	5.69	5.81	5.92
30	3.89	4.45	4.80	5.05	5.24	5.40	5.54	5.65	5.76
40	3.82	4.37	4.70	4.93	5.11	5.26	5.39	5.50	5.60
60	3.76	4.28	4.59	4.82	4.99	5.13	5.25	5.36	5.45
120	3.70	4.20	4.50	4.71	4.87	5.01	5.12	5.21	5.30
$\infty$	3.64	4.12	4.40	4.60	4.76	4.88	4.99	5.08	5.16

$n \backslash v$	11	12	13	14	15	16	17	18	19	20
1	253.2	260.0	266.2	271.8	277.0	281.8	286.3	290.4	294.3	298.0
2	32.59	33.40	34.13	34.81	35.43	36.00	36.53	37.03	37.50	37.95
3	17.13	17.53	17.89	18.22	18.52	18.81	19.07	19.32	19.55	19.77
4	12.57	12.84	13.09	13.32	13.53	13.73	13.91	14.08	14.24	14.40
5	10.48	10.70	10.89	11.08	11.24	11.40	11.55	11.68	11.81	11.93

16	6.46	6.56	6.66	6.74	6.82	6.90	6.97	7.03	7.09	7.15
17	6.38	6.48	6.57	6.66	6.73	6.81	6.87	6.94	7.00	7.05
18	6.31	6.41	6.50	6.58	6.65	6.73	6.79	6.85	6.91	6.97
19	6.25	6.34	6.43	6.51	6.58	6.65	6.72	6.78	6.84	6.89
20	6.19	6.28	6.37	6.45	6.52	6.59	6.65	6.71	6.77	6.82
24	6.02	6.11	6.19	6.26	6.33	6.39	6.45	6.51	6.56	6.61
30	5.85	5.93	6.01	6.08	6.14	6.20	6.26	6.31	6.36	6.41
40	5.69	5.76	5.83	5.90	5.96	6.02	6.07	6.12	6.16	6.21
60	5.53	5.60	5.67	5.73	5.78	5.84	5.89	5.93	5.97	6.01
120	5.37	5.44	5.50	5.56	5.61	5.66	5.71	5.75	5.79	5.83
$\infty$	5.23	5.29	5.35	5.40	5.45	5.49	5.54	5.57	5.61	5.65

## UPPER 5 PERCENT POINTS OF THE STUDENTIZED RANGE

## 2.11.S05

Column headings under  $n$  range from 1 through 20 at intervals of 1; row headings under  $v$  (Greek  $\nu$ ) range from 1 through 20 at intervals of 1, followed by 24, 30, 40, 60, 120,  $\infty$ ; entries are tabulated to two decimal places; 8 pages.

$\frac{n}{v}$	2	3	4	5	6	7	8	9	10
1	17.97	26.98	32.82	37.08	40.41	43.12	45.40	47.36	49.07
2	6.08	8.33	9.80	10.88	11.74	12.44	13.03	13.54	13.99
3	4.50	5.91	6.82	7.50	8.04	8.48	8.85	9.18	9.46
4	3.93	5.04	5.76	6.29	6.71	7.05	7.35	7.60	7.83
5	3.64	4.60	5.22	5.57	6.03	6.33	6.58	6.80	6.99

16	3.00	3.65	4.05	4.33	4.56	4.74	4.90	5.03	5.15
17	2.98	3.63	4.02	4.30	4.52	4.70	4.86	4.99	5.11
18	2.97	3.61	4.00	4.28	4.49	4.67	4.82	4.96	5.07
19	2.96	3.59	3.98	4.25	4.47	4.65	4.79	4.92	5.04
20	2.95	3.58	3.96	4.23	4.45	4.62	4.77	4.90	5.01
24	2.92	3.53	3.90	4.17	4.37	4.54	4.68	4.81	4.92
30	2.89	3.49	3.85	4.10	4.30	4.46	4.60	4.72	4.82
40	2.86	3.44	3.79	4.04	4.23	4.39	4.52	4.63	4.73
60	2.83	3.40	3.74	3.98	4.16	4.31	4.44	4.55	4.65
120	2.80	3.36	3.68	3.92	4.10	4.24	4.36	4.47	4.56
$\infty$	2.77	3.31	3.63	3.86	4.03	4.17	4.29	4.39	4.47

$\frac{n}{v}$	11	12	13	14	15	16	17	18	19	20
1	50.59	51.96	53.20	54.33	55.36	56.32	57.22	58.04	58.83	59.56
2	14.39	14.75	15.08	15.38	15.65	15.91	16.14	16.37	16.57	16.77
3	9.72	9.95	10.15	10.35	10.53	10.69	10.84	10.98	11.11	11.24
4	8.03	8.21	8.37	8.52	8.66	8.79	8.91	9.03	9.13	9.23
5	7.17	7.32	7.47	7.60	7.72	7.83	7.93	8.03	8.12	8.21

16	5.26	5.35	5.44	5.52	5.59	5.66	5.73	5.79	5.84	5.90
17	5.21	5.31	5.39	5.47	5.54	5.61	5.67	5.73	5.79	5.84
18	5.17	5.27	5.35	5.43	5.50	5.57	5.63	5.69	5.74	5.79
19	5.14	5.23	5.31	5.39	5.46	5.53	5.59	5.65	5.70	5.75
20	5.11	5.20	5.28	5.36	5.43	5.49	5.55	5.61	5.66	5.71
24	5.01	5.10	5.18	5.25	5.32	5.38	5.44	5.49	5.55	5.59
30	4.92	5.00	5.08	5.15	5.21	5.27	5.33	5.38	5.43	5.47
40	4.82	4.90	4.98	5.04	5.11	5.16	5.22	5.27	5.31	5.36
60	4.73	4.81	4.88	4.94	5.00	5.06	5.11	5.15	5.20	5.24
120	4.64	4.71	4.78	4.84	4.90	4.95	5.00	5.04	5.09	5.13
$\infty$	4.55	4.62	4.68	4.74	4.80	4.85	4.89	4.93	4.97	5.01

## UPPER 10 PERCENT POINTS OF THE STUDENTIZED RANGE

## 2.11.S10

Column headings under  $n$  range from 1 through 20 at intervals of 1; row headings under  $v$  (Greek  $n$ ) range from 1 through 20 at intervals of 1, followed by 24, 30, 40, 60, 120,  $\infty$ ; entries are tabulated to two decimal places; 8 pages.

$n \backslash v$	2	3	4	5	6	7	8	9	10
1	8.93	13.44	16.36	18.49	20.15	21.51	22.64	23.62	24.48
2	4.13	5.73	6.77	7.54	8.14	8.63	9.05	9.41	9.72
3	3.33	4.47	5.20	5.74	6.16	6.51	6.81	7.06	7.29
4	3.01	3.98	4.59	5.03	5.39	5.68	5.93	6.14	6.33
5	2.85	3.72	4.26	4.66	4.98	5.24	5.46	5.65	5.82

16	2.47	3.12	3.52	3.80	4.03	4.21	4.36	4.49	4.61
17	2.46	3.11	3.50	3.78	4.00	4.18	4.33	4.46	4.58
18	2.45	3.10	3.49	3.77	3.98	4.16	4.31	4.44	4.55
19	2.45	3.09	3.47	3.75	3.97	4.14	4.29	4.42	4.53
20	2.44	3.08	3.46	3.74	3.95	4.12	4.27	4.40	4.51
24	2.42	3.05	3.42	3.69	3.90	4.07	4.21	4.34	4.44
30	2.40	3.02	3.39	3.65	3.85	4.02	4.16	4.28	4.38
40	2.38	2.99	3.35	3.60	3.80	3.96	4.10	4.21	4.32
60	2.36	2.96	3.31	3.56	3.75	3.91	4.04	4.16	4.25
120	2.34	2.93	3.28	3.52	3.71	3.86	3.99	4.10	4.19
$\infty$	2.33	2.90	3.24	3.48	3.66	3.81	3.93	4.04	4.13

$n \backslash v$	11	12	13	14	15	16	17	18	19	20
1	25.24	25.92	26.54	27.10	27.62	28.10	28.54	28.96	29.35	29.71
2	10.01	10.26	10.49	10.70	10.89	11.07	11.24	11.39	11.54	11.68
3	7.49	7.67	7.83	7.98	8.12	8.25	8.37	8.48	8.58	8.68
4	6.49	6.65	6.78	6.91	7.02	7.13	7.23	7.33	7.41	7.50
5	5.97	6.10	6.22	6.34	6.44	6.54	6.63	6.71	6.79	6.86

16	4.71	4.81	4.89	4.97	5.04	5.11	5.17	5.23	5.28	5.33
17	4.68	4.77	4.86	4.93	5.01	5.07	5.13	5.19	5.24	5.30
18	4.65	4.75	4.83	4.90	4.98	5.04	5.10	5.16	5.21	5.26
19	4.63	4.72	4.80	4.88	4.95	5.01	5.07	5.13	5.18	5.23
20	4.61	4.70	4.78	4.85	4.92	4.99	5.05	5.10	5.16	5.20
24	4.54	4.63	4.71	4.78	4.85	4.91	4.97	5.02	5.07	5.12
30	4.47	4.56	4.64	4.71	4.77	4.83	4.89	4.94	4.99	5.03
40	4.41	4.49	4.56	4.63	4.69	4.75	4.81	4.86	4.90	4.95
60	4.34	4.42	4.49	4.56	4.62	4.67	4.73	4.78	4.82	4.86
120	4.28	4.35	4.42	4.48	4.54	4.60	4.65	4.69	4.74	4.78
$\infty$	4.21	4.28	4.35	4.41	4.47	4.52	4.57	4.61	4.65	4.69

## MISCELLANEOUS

n\* TO DETECT r BY t TEST AT  $\alpha = .01$  (TWO TAILED)

## 2.100.01

Column headings are: Desired Power, Population r; under Desired Power row headings are: .25, .50, .60, 2/3, .70, .75, .80, .85, .90, .95, .99; under Population r column subheadings are: .10, .20, .30, .40, .50, .60, .70, .80, .90; entries are four-digit to one-digit values; 2 pages.

Desired power	Population r								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
.25	362	90	40	23	15	11	8	6	5
.50	662	164	71	39	24	16	12	8	6
.60	797	197	86	47	29	19	13	9	7
2/3	901	222	96	53	32	21	15	10	7
.90	1480	364	157	85	51	34	22	15	9
.95	1790	440	190	102	62	40	26	17	11
.99	2390	587	253	136	82	52	34	23	13

<sup>a</sup>Reproduced from Table 3.4.1, in Cohen (1969) with permission of the publisher.

L VALUES FOR  $\alpha = .01$ 

## 2.100.01L

Column headings are:  $k_B$ , Power; under  $k_B$  row headings range from 1 through 16 at intervals of 1, from 16 through 24 at intervals of 2, from 24 through 40 at intervals of 4, from 40 through 100 at intervals of 10; under Power, column subheadings are: .10, .30, .50, .60, .70, .75, .80, .85, .90, .95, .99; entries are tabulated to two decimal places; 6 pages.

$k_B$	Power										
	.10	.30	.50	.60	.70	.75	.80	.85	.90	.95	.99
1	1.67	4.21	6.64	8.00	9.61	10.57	11.68	13.05	14.88	17.81	24.03
2	2.30	5.37	8.19	9.75	11.57	12.64	13.88	15.40	17.43	20.65	27.42
3	2.76	6.22	9.31	11.01	12.97	14.12	15.46	17.09	19.25	22.67	29.83
4	3.15	6.92	10.23	12.04	14.12	15.34	16.75	18.47	20.74	24.33	31.80
5	3.49	7.52	11.03	12.94	15.12	16.40	17.87	19.66	22.03	25.76	33.50
16	6.02	12.00	16.90	19.48	22.40	24.08	26.01	28.34	31.39	36.14	45.80
18	6.37	12.61	17.70	20.37	23.39	25.12	27.12	29.52	32.66	37.54	47.46
20	6.70	13.19	18.45	21.21	24.32	26.11	28.16	30.63	33.85	38.87	49.03
24	7.32	14.27	19.86	22.78	26.06	27.94	30.10	32.69	36.07	41.32	51.93
28	7.89	15.26	21.15	24.21	27.65	29.62	31.88	34.59	38.11	43.58	54.60
32	8.42	16.19	22.35	25.55	29.13	31.19	33.53	36.35	40.01	45.67	57.07
60	11.46	21.48	29.21	33.18	37.59	40.10	42.96	46.38	50.79	57.58	71.12
70	12.37	23.05	31.25	35.45	40.10	42.75	45.76	49.35	53.99	61.11	75.27
80	13.22	24.51	33.15	37.55	42.43	45.21	48.36	52.11	56.96	64.39	79.13
90	14.01	25.89	34.93	39.53	44.62	47.52	50.80	54.71	59.75	67.47	82.76
100	14.76	27.19	36.62	41.41	46.70	49.70	53.11	57.16	62.38	70.37	86.18

n\* TO DETECT r BY t TEST AT  $\alpha = .05$  (TWO TAILED)

## 2.100.05

Column headings are: Desired Power, Population r; under Desired Power row headings are: .25, .50, .60, 2/3, .70, .75, .80, .85, .90, .95, .99; under Population r column headings are: .10, .20, .30, .40, .50, .60, .70, .80, .90; entries are four-digit to one-digit values; 2 pages.

Desired power	Population r								
	.10	.20	.30	.40	.50	.60	.70	.80	.90
.25	166	42	20	12	8	6	5	4	3
.50	384	95	42	24	15	10	7	6	4
.60	489	121	53	29	18	12	9	6	5
2/3	570	141	62	34	21	14	10	7	5
.90	1046	258	112	61	37	24	16	11	7
.95	1308	322	139	75	46	30	19	13	8
.99	1828	449	194	104	63	40	27	18	11

\*Reproduced from Table 3.4.1 in Cohen (1969) with permission of the publisher.

L VALUES FOR  $\alpha = .05$ 

## 2.100.05L

Column headings are:  $k_B$ , Power; under  $k_B$  row headings range from 1 through 16 at intervals of 1, from 16 through 24 at intervals of 2, from 24 through 40 at intervals of 4, from 40 through 100 at intervals of 10; under Power, column headings are: .10, .30, .50, .60, .70, .75, .80, .85, .90, .95, .99; entries are tabulated to two decimal places; 6 pages.

$k_B$	Power										
	.10	.30	.50	.60	.70	.75	.80	.85	.90	.95	.99
1	.43	2.06	3.84	4.90	6.17	6.94	7.85	8.98	10.51	13.00	18.37
2	.62	2.78	4.96	6.21	7.70	8.59	9.64	10.92	12.65	15.44	21.40
3	.78	3.30	5.76	7.15	8.79	9.77	10.90	12.30	14.17	17.17	23.52
4	.91	3.74	6.42	7.92	9.68	10.72	11.94	13.42	15.41	18.57	25.24
5	1.03	4.12	6.99	8.59	10.45	11.55	12.83	14.39	16.47	19.78	26.73
16	1.90	6.91	11.16	13.43	16.03	17.53	19.27	21.37	24.13	28.45	37.33
18	2.03	7.29	11.73	14.09	16.78	18.34	20.14	22.31	25.16	29.62	38.76
20	2.14	7.65	12.26	14.71	17.50	19.11	20.96	23.20	26.13	30.72	40.10
24	2.36	8.33	13.02	15.87	18.82	20.53	22.49	24.85	27.94	32.76	42.59
28	2.56	8.94	14.17	16.93	20.04	21.83	23.89	26.36	29.60	34.64	44.87
32	2.74	9.52	15.02	17.91	21.17	23.04	25.19	27.77	31.14	36.37	46.98
60	3.80	12.81	19.88	23.53	27.61	29.94	32.59	35.77	39.89	46.25	58.98
70	4.12	13.79	21.32	25.20	29.52	31.98	34.79	38.14	42.48	49.17	62.53
80	4.41	14.70	22.67	26.75	31.29	33.88	36.83	40.35	44.89	51.89	65.83
90	4.69	15.56	23.93	28.21	32.96	35.67	38.75	42.14	47.16	54.44	68.92
100	4.95	16.37	25.12	29.59	34.54	37.36	40.56	44.37	49.29	56.85	71.84

## PROCEDURES FOR STATISTICAL INFERENCE

## 2.100.1

This table suggests equations and procedures for solving statistical problems and hypotheses; also methods for testing; 7 pages.

(Study your problem. Doesn't one of these outlines fit? Use it.)

I Estimation	
1. PROPORTIONS	2. MEANS
$n =$ $p =$ c.i. % =	$n =$ $\bar{x} =$ $s =$
II Testing Hypotheses	
1. PROPORTIONS (NORMAL DISTRIBUTION) $H_0: \pi =$ $H_1: \pi(\neq, >, <)(?)$	2. MEANS (NORMAL DISTRIBUTION) $H_0: \mu =$ $H_1: \mu(\neq, >, <)(?)$
3. PROPORTIONS (CHI-SQUARE) $H_0:$ no significant difference $H_1:$ is significant difference $\alpha =$ $r =$ $c =$ $d.f. = (r - 1)(c - 1)$ $\chi^2 =$	
4. MEANS (ANOVA) $H_0:$ no significant difference $H_1:$ is significant difference $\alpha =$ $r =$ $c =$ $n.d.f. = c - 1 =$ $d.f. = c(r - 1) =$ $F =$	
5. PAIRED VARIABLES (CORRELATION) $H_0:$ no significant difference $H_1:$ is significant difference $n =$ $\alpha =$ $d.f. = n - 2 =$ $r_s =$	
III Regression Equations	
$n =$ table for $x, y, x^2, y^2, xy$ $a = \frac{(\sum y)(\sum x^2) - (\sum x)(\sum xy)}{n(\sum x^2) - (\sum x)^2}$ $b = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}$ $y = bx + a$	

## 0.95 CONFIDENCE INTERVALS FOR PROPORTIONS

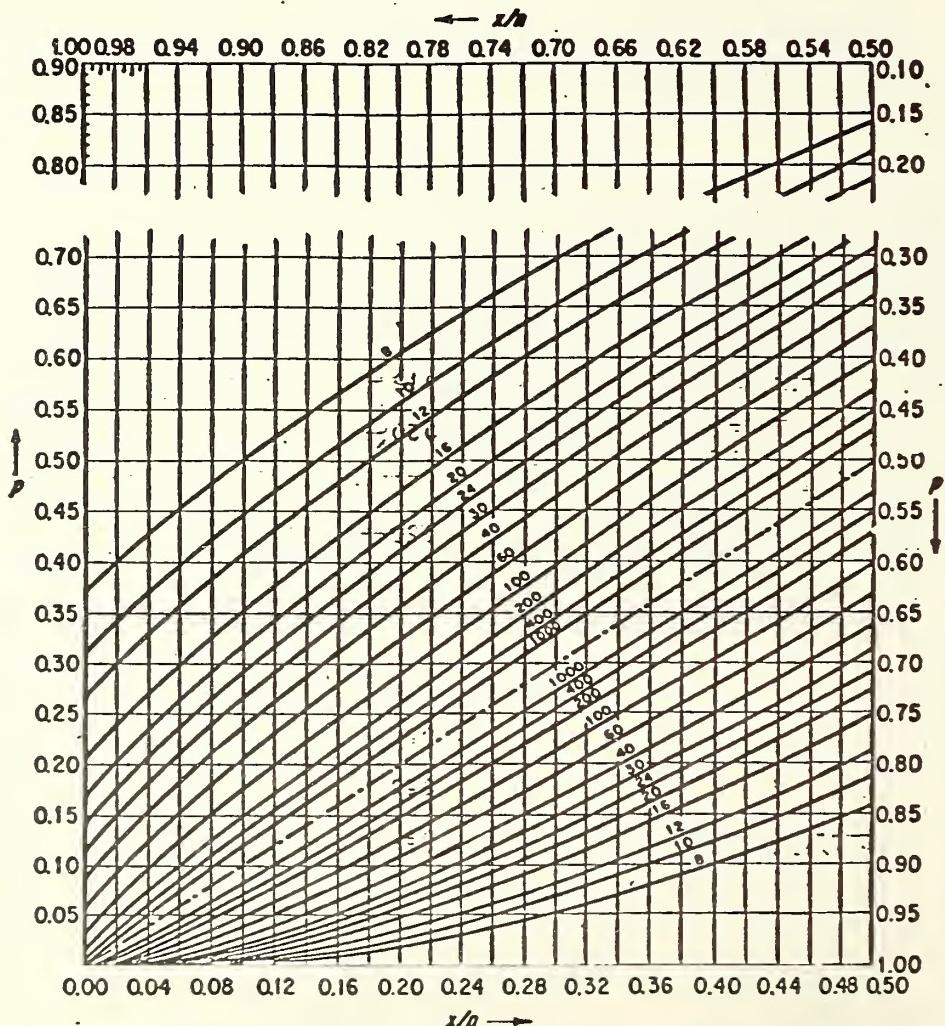
2.100.195

## 0.99 CONFIDENCE INTERVALS FOR PROPORTIONS

2.100.199 (Illustrated - next page)

Tables (drawings) have two families of curves - one for the 0.95 level and one for the 0.99 level. For each family the lower and upper horizontal scales are respectively labeled  $x/n \rightarrow$  and  $\leftarrow x/n$ ; the lower scale ranges from 0.00 through 0.50 and the upper scale ranges from 0.50 through 1.00; the left and right vertical scales are respectively labeled  $\uparrow$  and  $\downarrow$  p;

the left scale ranges from 0.00 through 0.90; the right scale ranges from 0.10 through 1.00; there are thirteen pairs of curves in each family; in each pair one member is antisymmetrically associated with a member of the other; the values of n which correspond to these pairs are: 8, 10, 12, 16, 20, 24, 30, 40, 60, 100, 200, 400, 1000; a note describes the families and how they have been transcribed into braille; 10 pages.

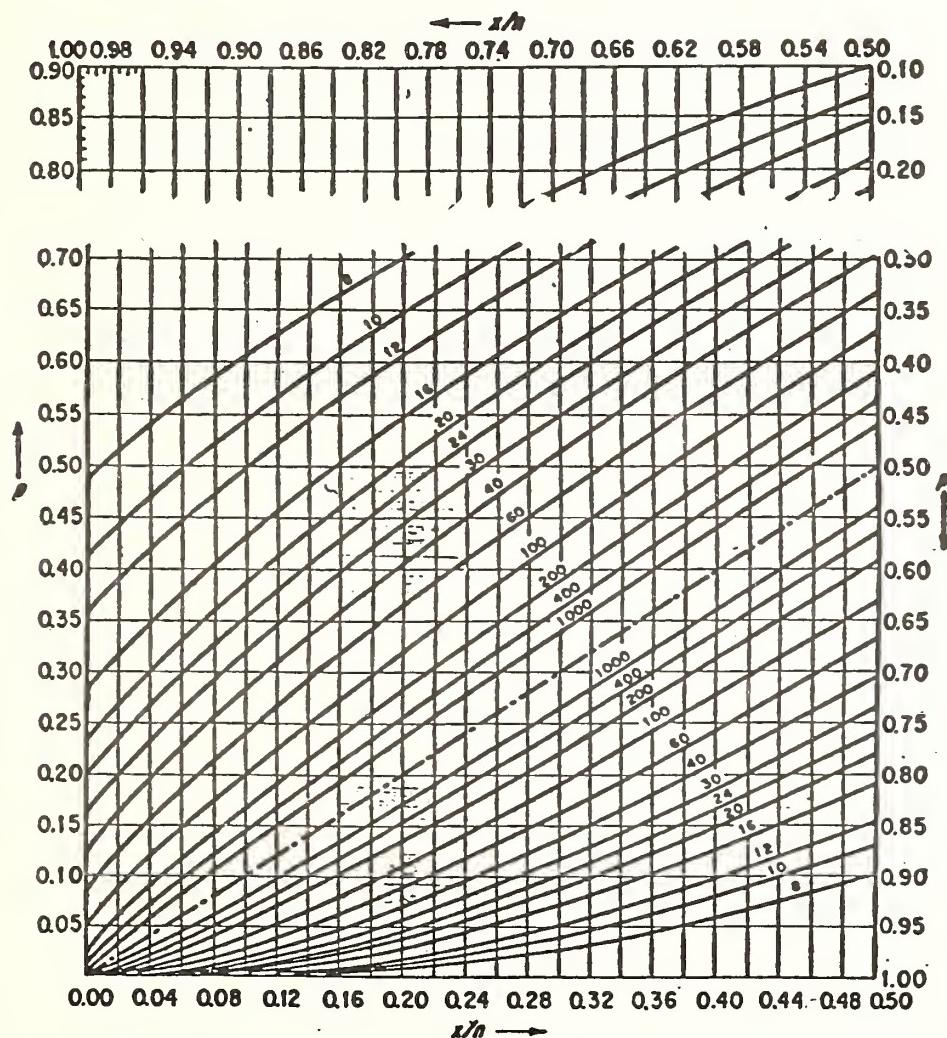


\* This table is reproduced from Table 41 of the *Biometrika Tables for Statisticians*, Vol. I (New York: Cambridge University Press, 1954) by permission of the *Biometrika* trustees.

## 0.99 CONFIDENCE INTERVALS FOR PROPORTIONS

2.100.199

See opposite page for description.



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## TRANSFORMATION OF RANKS TO STANDARD SCORES

2.100.2

## TRANSFORMATION OF RANKS TO STANDARD SCORES

2.100.2

Headings are: Rank, Number of Persons Ranked; row headings under Rank range from 1 through 30 at intervals of 1; column Number of Persons Ranked has subheadings ranging from 5 through 30 at intervals of 1; entries are two-digit values; 5 pages.

Rank	Number of Persons Ranked																												Rank	
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30				
1	63	64	65	65	66	66	67	67	68	68	69	69	69	70	70	70	70	71	71	71	71	71	71	71	71	71	71	1		
2	55	57	58	59	60	60	61	62	62	62	63	64	64	64	64	65	65	65	66	66	66	66	66	66	66	66	66	66	2	
3	50	52	54	55	56	57	57	58	58	59	60	60	61	61	62	62	62	63	63	63	63	63	63	64	64	64	64	3		
4	45	48	50	52	53	54	55	56	56	57	58	58	59	59	60	60	61	61	61	61	62	62	62	62	62	62	62	62	4	
5	37	43	46	48	50	51	52	53	54	55	55	56	56	57	57	58	58	59	59	59	59	59	59	59	59	59	59	59	5	
6	30	42	45	47	49	50	51	52	53	54	55	55	56	56	57	57	57	58	58	58	58	58	58	58	58	58	58	58	6	
7	35	41	44	46	48	49	50	51	52	53	54	54	55	55	55	55	56	56	56	56	56	56	56	56	56	56	56	56	7	
8	36	40	43	45	47	48	49	50	51	52	53	53	54	54	54	55	55	55	55	55	55	55	55	55	55	55	55	55	8	
9	34	39	43	45	46	47	48	49	50	51	52	53	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	54	9	
10	34	39	42	44	45	47	48	49	50	51	52	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	10	
11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	11
12	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	12
13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	13
14	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	14
15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	15
16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	16
17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	17
18	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	18
19	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	19
20	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20
21	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	21
22	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	22
23	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	23
24	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	24
25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	25
26	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	26
27	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	27
28	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	28
29	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	29
30	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	30

From *Improvement of Grading Practices for Air Training Command Schools, ATRC Manual 50-000-9*.

### 3. CHEMISTRY

# PERIODIC TABLE OF THE ELEMENTS

3.1.500

This table contains the standard configuration of the first 105 chemical elements of the Periodic Table. The Lanthanide and Actinide Series are clearly designated, and the differentiation between metals and nonmetals is indicated. For each element the following information is supplied: atomic number, atomic weight, symbol, name, and electron configuration. The braille version consists of (a) a note describing the structure of the table (b) a skeleton exhibiting the geometric configuration of the table and showing its principal features (c) an enlarged skeleton showing the various "Periods" and "Groups" of the table and listing the atomic numbers of the individual elements (d) a sample box showing what information is available and where it may be found for each box of the table (e) a data section for the main body of the table and (f) a data section for the Lanthanide and Actinide Series; 22 pages.

Lanthanide Series														
58	59	60	61	62	63	64	65	66	67	68	69	70	71	
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	
140.12	140.908	144.24	(147)	150.4	151.96	157.25	158.925	162.50	164.930	167.26	168.934	173.04	174.97	

Actinide Series													
90	91	92	93	94	95	96	97	98	99	100	101	102	103
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
(232)	(231)	(238)	(237)	(242)	(243)	(248)	(249)	(249)	(254)	(257)	(258)	(259)	(260)

The most stable known isotopes are shown in parentheses.

The discovery of elements 104 and 105 has been claimed by both American and Russian scientists. The Americans have suggested the names *rutherfordium* and *bohrium*, the Russians have suggested the names *kurchatovium* and *ovchinnikovium*.

## IONIZATION POTENTIALS FOR SOME CHEMICAL ELEMENTS (eV/atom)

## 3.2.400

Column headings are: Atomic Number, Symbol, First  $e^-$ , Second  $e^-$ , Third  $e^-$ , Fourth  $e^-$ , Fifth  $e^-$ ; the first twenty-two chemical elements are listed by atomic number and symbol; ionization potentials are listed to three decimal places; 4 pages.

Atomic number	Symbol	First $e^-$	Second $e^-$	Third $e^-$	Fourth $e^-$	Fifth $e^-$
1	H	13.595				
2	He	24.580	54.40			
3	Li	5.390	75.6193	122.420		
4	Be	9.320	18.206	153.850	217.657	
5	B	8.296	25.149	37.920	259.298	340.127
6	C	11.264	24.376	47.864	61.476	391.986
7	N	14.54	29.605	47.426	77.450	97.863

10	Ne	21.559	41.07	64	87.16	126.4
11	Na	5.138	47.29	71.65	98.88	138.60
12	Mg	7.644	15.03	80.12	109.29	141.23
13	Al	5.984	18.823	28.44	119.96	153.77
14	Si	8.149	16.34	33.46	45.13	166.73
15	P	11.0	19.65	30.156	51.354	65.007
16	S	10.357	23.4	35.0	47.29	72.5
17	Cl	13.01	23.80	39.90	53.5	67.80
18	Ar	15.755	27.62	40.90	59.79	75.0
19	K	4.339	31.81	46	60.90	
20	Ca	6.111	11.87	51.21	67	81.39
21	Sc	6.56	12.89	24.75	73.9	92
22	Ti	6.83	13.63	28.14	43.24	99.8

\*1.0 eV =  $3.8 \times 10^{-20}$  cal.

Source: Reprinted by permission from Therald Moeller, Inorganic Chemistry (New York: Wiley, 1952).

## LIST OF COMMON ELEMENTS

## 3.2.500

Column headings are: Name of element, Symbol, Atomic number, Mass number; thirty-six of the more common elements are listed; Atomic number and Mass number of each element is rounded off to nearest whole number; 2 pages.

Name of element	Symbol	Atomic number	Mass number	Name of element	Symbol	Atomic number	Mass number
Aluminum	Al	13	27	Lithium	Li	3	7
Barium	Ba	56	137	Magnesium	Mg	12	24
Bismuth	Bi	83	209	Manganese	Mn	25	55
Boron	B	5	11	Mercury	Hg	80	201
Bromine	Br	35	80	Neon	Ne	10	20
Calcium	Ca	20	40	Nickel	Ni	28	59

Cobalt	Co	27	59	Platinum	Pt	78	195
Copper	Cu	29	64	Potassium	K	19	39
Fluorine	F	9	19	Silicon	Si	14	28
Gold	Au	79	197	Silver	Ag	47	108
Helium	He	2	4	Sodium	Na	11	23
Hydrogen	H	1	1	Sulfur	S	16	32
Iodine	I	53	127	Tin	Sn	50	119
Iron	Fe	26	56	Tungsten	W	74	184
Lead	Pb	82	207	Zinc	Zn	30	65

## SOME COMMON ELEMENTS

## 3.2.501

The first column lists thirty-four common elements alphabetically by name; successive columns are headed: Symbol, Atomic Number (no. protons), Approximate Atomic Weight, Arrangement of Electrons in Shells; 3 pages.

Name	Symbol	Atomic number (no. protons)	Approximate atomic weight	Arrangement of electrons in shells						
				1	2	3	4	5	6	7
aluminum	Al	13	27	2	8	3				
antimony	Sb	51	122	2	8	18	18	5		
argon	Ar	18	40	2	8	8				
barium	Ba	56	137	2	8	18	18	8	2	
bromine	Br	35	80	2	8	18	7			
<hr/>										
magnesium	Mg	12	24	2	8	2				
mercury	Hg	80	201	2	8	18	32	18	2	
neon	Ne	10	20	2	8					
nitrogen	N	7	14	2	5					
oxygen	O	8	16	2	6					
<hr/>										
sodium	Na	11	23	2	8	1				
sulfur	S	16	32	2	8	6				
thorium	Th	90	232	2	8	18	32	18	10	2
tin	Sn	50	119	2	8	18	18	4		
uranium	U	92	238	2	8	18	32	21	9	2
zinc	Zn	30	65	2	8	18	2			

## VALENCES

## 3.2.503

Valences of positive one, positive two, positive three, positive four, positive five; valences of negative one, negative two, negative three; as held by certain elements and compounds; 4 pages.

<i>Positive Valences</i>	<i>Negative Valences</i>
<i>Valence of positive one</i> Ammonium, $\text{NH}_4^+$ Copper (I), $\text{Cu} (\text{I})^+$ Hydrogen, $\text{H}^+$ Lithium, $\text{Li}^+$ Potassium, $\text{K}^+$ Silver, $\text{Ag}^+$ Sodium, $\text{Na}^+$	<i>Valence of negative one</i> Acetate, $\text{C}_2\text{H}_3\text{O}_2^-$ Bromide, $\text{Br}^-$ Chlorate, $\text{ClO}_3^-$ Chloride, $\text{Cl}^-$ Chlorite, $\text{ClO}_2^-$ Fluoride, $\text{F}^-$ Hydroxide, $\text{OH}^-$ Hypochlorite, $\text{ClO}^-$ Iodide, $\text{I}^-$ Nitrite, $\text{NO}_2^-$ Nitrate, $\text{NO}_3^-$ Perchlorate, $\text{ClO}_4^-$ Permanganate, $\text{MnO}_4^-$
<i>Valence of positive two</i> Barium, $\text{Ba}^{++}$ Cadmium, $\text{Cd}^{++}$ Calcium, $\text{Ca}^{++}$ Chromium (II), $\text{Cr} (\text{II})^{++}$ Cobalt (II), $\text{Co} (\text{II})^{++}$ Copper (II), $\text{Cu} (\text{II})^{++}$ Iron (II), $\text{Fe} (\text{II})^{++}$ Lead, $\text{Pb}^{++}$ Magnesium, $\text{Mg}^{++}$	<i>Valence of negative two</i> Carbonate, $\text{CO}_3^{-2}$ Chromate, $\text{CrO}_4^{-2}$ Dichromate, $\text{Cr}_2\text{O}_7^{-2}$

Tin (II), $\text{Sn} (\text{II})^{++}$ Zinc, $\text{Zn}^{++}$	Sulfate, $\text{SO}_4^{-2}$ Sulfide, $\text{S}^{-2}$ Sulfite, $\text{SO}_3^{-2}$ Thiosulfate, $\text{S}_2\text{O}_3^{-2}$
<i>Valence of positive three</i> Aluminum, $\text{Al}^{+++}$ Antimony(III), $\text{Sb} (\text{III})^{+++}$ Chromium(III), $\text{Cr} (\text{III})^{+++}$ Iron (III), $\text{Fe} (\text{III})^{+++}$	<i>Valence of negative three</i> Phosphate, $\text{PO}_4^{-3}$
<i>Valence of positive four</i> Tin (IV), $\text{Sn} (\text{IV})^{++++}$	
<i>Valence of positive five</i> Antimony(V), $\text{Sb} (\text{V})^{+++++}$	

## THE ELEMENTS

## 3.2.600

Column headings are: Symbol, Name, Atomic number, Atomic Weight; elements are listed alphabetically by name; atomic numbers are integers from 1 through 105; atomic weights are listed, for the most part, to five significant figures; notes are included; 7 pages.

Symbol	Name*	Atomic number	Atomic weight†	Symbol	Name*	Atomic number	Atomic weight†
Ac	actinium	89	(227)	Hg	mercury (hydrargyrum)	80	200.59
Al	aluminum	13	26.9815	Mo	molybdenum	42	95.94
Am	americium	95	(243)	Nd	neodymium	60	144.24
Sb	antimony (stibium)	51	121.75	Ne	neon	10	20.18
Ar	argon	18	39.948	Np	neptunium	93	237.0
As	arsenic	33	74.9216	Ni	nickel	28	58.71
At	astatine	85	(210)	Nb	niobium	41	92.91
Ba	barium	56	137.34	N	nitrogen	7	14.0067
Bk	berkelium	97	(247)	No	nobelium§	102	(255)
Be	beryllium	4	9.012	Os	osmium	76	190.2
Bi	bismuth	83	208.98	O	oxygen	8	15.9994
B	boron	5	10.811	Pd	palladium	46	106.4
Br	bromine	35	79.909	P	phosphorus	15	30.974
Cd	cadmium	48	112.40	Pt	platinum	78	195.09

F	fluorine	9	18.9984	Se	selenium	34	78.96
Fr	francium	87	(223)	Si	silicon	14	28.086
Gd	gadolinium	64	157.25	Ag	silver (argentum)	47	107.868
Ga	gallium	31	69.72	Na	sodium (natrium)	11	22.9898
Ge	germanium	32	72.59	Sr	strontium	38	87.62
Au	gold (aurum)	79	196.97	S	sulfur	16	32.06
Hf	hafnium	72	178.49	Ta	tantalum	73	180.95
Ha	hahnium‡	105	(260)	Tc	technetium	43	(99)
He	helium	2	4.0026	Te	tellurium	52	127.60
Ho	holmium	67	164.93	Tb	terbium	65	158.9
H	hydrogen	1	1.0080	Tl	thallium	81	204.37
In	indium	49	114.82	Th	thorium	90	232.0
I	iodine	53	126.904	Tm	thulium	69	168.93
Ir	iridium	77	192.22	Sn	tin (stannum)	50	118.69
Fe	iron (ferrum)	26	55.847	Ti	titanium	22	47.90
Kr	krypton	36	83.80	W	tungsten (wolfram)	74	183.85
La	lanthanum	57	138.91	U	uranium	92	238.03
Lr	lawrencium	103	(256)	V	vanadium	23	50.94
Pb	lead (plumbum)	82	207.2	Xe	xenon	54	131.30
Li	lithium	3	6.94	Yb	ytterbium	70	173.04
Lu	lutetium	71	174.97	Y	yttrium	39	88.91
Mg	magnesium	12	24.31	Zn	zinc	30	65.37
Mn	manganese	25	54.938	Zr	zirconium	40	91.22
Md	mendelevium	101	(258)				

\*The names in parentheses are the Latin forms used in complex formation: e.g., gold (*aurum*);  $[AuCl_4]^-$  is tetrachloroaurate(III). (Exception is wolfram, which has a German derivation.)

†Atomic weights in parentheses are those of the most stable radioisotope.

‡This name has been suggested by American researchers and has not yet been approved by IUPAC. Russian researchers have suggested the name *nielsbohrium*.

§Although the name nobelium has official IUPAC sanction, some Russian researchers use the name *joliotium*.

\*\*This name has been suggested by American researchers and has not yet been approved by IUPAC. Russian researchers have suggested the name *kurchatovium*.

## PHYSICAL CONSTANTS OF THE ELEMENTS

## 3.2.600A

Column headings are: Element, Symbol, Valence, Atomic Number, Atomic Weight, Density ( $\text{g}/\text{ml}$ ), Melting Point °C., Boiling Point °C.; elements are listed alphabetically; entries under Atomic Weight are tabulated to five significant figures for the most part; entries under Density are tabulated to three significant figures for the most part; entries under Melting Point and Boiling Point are tabulated to one decimal place; 14 pages.

Element*	Symbol	Valence	Atomic Number	Atomic Weight	Density ( $\text{g}/\text{ml}$ )	Melting Point °C.	Boiling Point °C.	Element*	Symbol	Valence	Atomic Number	Atomic Weight	Density ( $\text{g}/\text{ml}$ )	Melting Point °C.	Boiling Point °C.
Actinium.....	Ae	3	89	(227)	2.70	1050.0	2460.0	Phosphorus.....	P	$\pm 3$ ; 4	15	30.9738	1.82	44.2	290.0
Aluminum.....	Al	3	13	26.9816	11.7	680.0	2600.0	Platinum.....	Pt	2	78	193.00	21.4	1760.0	4330.0
Anerium.....	Am	2, 4, 5, 6	96	(243)	6.62	630.5	1380.0	Plutonium.....	Pu	3, 4, 5, 6	84	(212)	0.10	610.0	3235.0
Sb	3, 5	61	121.75	1.10	-189.4	-185.8	Potassium.....	Na	2	84	(210)	0.85	254.0	780.0	
Antimony.....	Sb	3, 5	18	39.948	7.32	817.0	613.0 <sup>a</sup>	Polonium.....	Po	2	19	39.102	0.85	63.7	320.0
Arco.....	Ar	0	1	74.922	5.72	(202)	160.0	Praseodymium.....	Pr	3, 4	69	140.907	5.77	919.0	3200.0
Armenit.....	Ar	$\pm 3$ ; 6	33	(210)	3.5	714.0	1600.0	Protactinium.....	Pa	3	61	(147)	6.77	(1027)	
Armenit.....	Ar	$\pm 3$ ; 6	85	(210)	66	217.0	420.0	Ruthenium.....	Ru	4, 5	91	(231)	16.4	(1236)	
Aratine.....	Al	2	66	131.34	9.7	(217)	1.85	Radium.....	Ra	2	88	(226)	8.0	(700.0	
Barium.....	Be	2	97	0.0122	277.0	1560.0	1560.0	Radon.....	Rn	0	86	(222)	(-71.6)	(-61.6)	
Berkelium.....	Bk	2	94	208.980	9.8	271.3	(2030)	Rhenium.....	Re	1, 2, 3, 4, 7	75	3180.0	5900.0	5900.0	
Beryllium.....	Be	2	93	10.811	2.34	102.909	102.909	Rhodium.....	Rh	2, 3, 4	45	102.905	12.4	1066.0	4500.0
Bismuth.....	Bi	3	85	79.069	3.12	-7.2	68.0	Rubidium.....	Rb	1	27	95.47	1.35		
Boron.....	B	3	36	11.40	1.45	370.0	370.0	Ruthenium.....	Ru	4	1	1.3	1.0	38.9	88.0
Bromine.....	Br	$\pm 1$ ; 4, 5	48					Sulfur.....	S	4	1	1	1	1	
Cadmium.....	Cd	2	46					Silver.....	Ag	1	47	107.870	10.5	196.8	J.C.
Californium.....	Cf	0	26	63.47	2.6	-187.3	-193.0	Sodium.....	Na	1	11	22.9998	0.97	97.0	2210.0
Lanthanum.....	La	-	67	83.850	6.10	920.0	3470.0	Stronium.....	Sr	2	38	87.62	2.6	768.0	892.0
Lawrencium.....	La	-	103	207.19	11.4	327.4	1725.0	Sulfur.....	S	3, 4, 6	16	32.004	2.07	1380.0	1380.0
Lead.....	Pb	2, 4	82	6.939	0.53	108.5	1350.0	Titanium.....	Ti	5	73	180.948	16.6	444.0	444.0
Lithium.....	Li	1	3	17.91	0.86	1652.0	1930.0	Technetium.....	Tc	2	43	(99)	(210)	2996.0	825.0
Lutecium.....	Lu	3	71	24.312	1.74	650.0	1107.0	Tellurium.....	Tl	3, 4	62	127.60	6.24	11.5	11.5
Nickelium.....	Ni	2	12	54.938	7.43	1215.0	2150.0	Terbium.....	Tb	3, 4	65	168.924	8.25	1356.0	1356.0
Niavangnes.....	Ni	2, 3, 4, 6, 7	28	(256)	13.6	-38.4	357.0	Thallium.....	Tl	1, 3	81	204.37	11.85	1437.0	
Nihelium.....	Ni	101	101	200.59	10.2	2610.0	4500.0	Thorium.....	Th	4	90	232.038	11.7	1750.0	3850.0
Mercury.....	Hg	1, 2	42	14.24	7.00	1019.0	3170.0	Thulium.....	Tm	5	69	188.934	9.32	188.934	
Molybdenum.....	Mo	2, 3, 4, 5, 6	60	14.24	20.183	1.20	-248.6	Tin.....	Ti	2, 4	50	118.69	7.30	1720.0	1720.0
Neodymium.....	Nd	3	60	93	10.	(237)	19.5	Titanium.....	Ti	3, 4	22	47.90	4.51	231.9	231.9
Neon.....	Ne	0	10	1.456	0.81	0.37	0.37	Tungsten.....	W	2, 3, 4, 5, 6	74	183.85	10.3	1668.0	1668.0
Neplonium.....	Np	1, 4, 5, 6	93	1.20	8.9	1453.0	2730.0	Uranium.....	U	3, 4, 5, 6	93	238.04	19.07	1930.0	1930.0
Nickel.....	Ni	2, 2, 1	28	58.71	8.4	2415.0	3300.0	Vanadium.....	V	2, 3, 4, 5	23	50.943	6.1	1132.0	3818.0
Niobium.....	Nb	3, 5	41	92.906	0.81	-210.0	-195.8	Xenon.....	Xe	0	54	131.30	3.06	-108.0	3450.0
Nitrogen.....	N	2, $\pm 3$ ; 4, 5	7	14.0067	(254)	102		Ytterbium.....	Yb	2, 3	70	173.04	6.98	-821.0	-1530.0
Nobrium.....	No	0	102					Yttrium.....	Y	3	39	88.904	4.47	1509.0	3030.0
Osmium.....	Os	2, 3, 4, 5, 6	76	190.3	22.6	2700.0	5600.0	Zinc.....	Zn	2	30	65.37	7.14	419.5	904.0
Oxygen.....	O	-2	8	16.0994	1.14	-218.8	-183.0	Zirconium.....	Zr	4	40	91.22	6.49	1853.0	3580.0
Palladium.....	Pd	2, 4	46	108.4	12.0	1832.0	3980.0								

\*The 103 chemical elements known at the present time are included in this table. Some of those recently discovered have been obtained only as unstable isotopes.

Based on Carbos-12. Figures enclosed in parentheses represent the mass number of the most stable isotope.

†Element symbols unless under pressure.

## PHYSICAL CONSTANTS OF THE ELEMENTS

## 3.2.600A

**TABLE OF INTERNATIONAL RELATIVE ATOMIC MASSES**

**3.6.601**

Column headings are: Element, Symbol, Atomic Number, Atomic Mass; Atomic Numbers are integers 1 through 103; Elements are listed alphabetically; Atomic Mass entries are tabulated to one decimal place for the most part; 7 pages.

Element	Symbol	Atomic Number	Atomic Mass	Element	Symbol	Atomic Number	Atomic Mass
Actinium	Ac	89	(227)	Mercury	Hg	80	200.6
Aluminum	Al	13	27.0	Molybdenum	Mo	42	95.9
Americium	Am	95	(243)	Neodymium	Nd	60	144.2
Antimony	Sb	51	121.8	Neon	Ne	10	20.2
Argon	Ar	18	39.9	Neptunium	Np	93	237.0
Arsenic	As	33	74.9	Nickel	Ni	28	58.7
Astatine	At	85	(210)	Niobium	Nb	41	92.9
Barium	Ba	56	137.3	Nitrogen	N	7	14.0
Berkelium	Bk	97	(245)	Nobelium	No	102	(254)
Beryllium	Be	4	9.01	Osmium	Os	76	190.2
Bismuth	Bi	83	209.0	Oxygen	O	8	16.0
Boron	B	5	10.8	Palladium	Pd	46	106.4
Bromine	Br	35	79.9	Phosphorus	P	15	31.0
Cadmium	Cd	48	112.4	Platinum	Pt	78	195.1
Calcium	Ca	20	40.1	Plutonium	Pu	94	(242)
Californium	Cf	98	(251)	Polonium	Po	84	(210)
Carbon	C	6	12.0	Potassium	K	19	39.1
Cerium	Ce	58	140.1	Praseodymium	Pr	59	140.9
Cesium	Cs	55	132.9	Promethium	Pm	61	(145)
Chlorine	Cl	17	35.5	Protactinium	Pa	91	231.0
Chromium	Cr	24	52.0	Radium	Ra	88	226.0
Cobalt	Co	27	58.9	Radon	Rn	86	(222)
Copper	Cu	29	63.5	Rhenium	Re	75	186.2
Curium	Cm	96	(245)	Rhodium	Rh	45	102.9
Dysprosium	Dy	66	162.5	Rubidium	Rb	37	85.5
Einsteinium	Es	99	(254)	Ruthenium	Ru	44	101.1
Erbium	Er	68	167.3	Samarium	Sm	62	150.4
Europium	Eu	63	152.0	Scandium	Sc	21	45.0

Gadolinium	Gd	64	157.3	Sodium	Na	11	23.0
Gallium	Ga	31	69.7	Strontium	Sr	38	87.6
Germanium	Ge	32	72.6	Sulfur	S	16	32.1
Gold	Au	79	197.0	Tantalum	Ta	73	180.9
Hafnium	Hf	72	178.5	Technetium	Tc	43	98.9
Helium	He	2	4.00	Tellurium	Te	52	127.6
Holmium	Ho	67	164.9	Terbium	Tb	65	158.9
Hydrogen	H	1	1.008	Thallium	Tl	81	204.4
Indium	In	49	114.8	Thorium	Th	90	232.0
Iodine	I	53	126.9	Thulium	Tm	69	168.9
Iridium	Ir	77	192.2	Tin	Sn	50	118.7
Iron	Fe	26	55.8	Titanium	Ti	22	47.9
Krypton	Kr	36	83.8	Tungsten	W	74	183.8
Lanthanum	La	57	138.9	Uranium	U	92	238.0
Lawrencium	Lr	103	(257)	Vanadium	V	23	50.9
Lead	Pb	82	207.2	Xenon	Xe	54	131.3
Lithium	Li	3	6.94	Ytterbium	Yb	70	173.0
Lutetium	Lu	71	175.0	Yttrium	Y	39	88.9
Magnesium	Mg	12	24.3	Zinc	Zn	30	65.4
Manganese	Mn	25	54.9	Zirconium	Zr	40	91.2
Mendelevium	Md	101	(256)				

Numbers in parentheses give the mass number of the most stable isotope

## MOLAR MASSES OF THE ELEMENTS

## 3.2.602

Column headings are: Element, Symbol, Atomic Number, Molar Mass; Atomic Numbers range from 1 through 103; entries under Molar Mass are tabulated to two or three decimal places for the most part; 6 pages.

Element	Symbol	Atomic Number	Molar Mass
Actinium	Ac	89	(227)
Aluminum	Al	13	26.98
Americium	Am	95	(243)
Antimony	Sb	51	121.75
Argon	Ar	18	39.948
Arsepic	As	33	74.92
Astatine	At	85	(210)
Barium	Ba	56	137.34
Berkelium	Bk	97	(249)
Beryllium	Be	4	9.012
Bismuth	Bi	83	208.98
Boron	B	5	10.81
Bromine	Br	35	79.909
Cadmium	Cd	48	112.40
Calcium	Ca	20	40.08
Californium	Cf	98	(251)
Carbon	C	6	12.011
Cerium	Ce	58	140.12
Cesium	Cs	55	132.91
Chlorine	Cl	17	35.453
Chromium	Cr	24	52.00
Cobalt	Co	27	58.93
Copper	Cu	29	63.54
Curium	Cm	96	(247)

Ruthenium	Ru	44	101.1
Samarium	Sm	62	150.35
Scandium	Sc	21	44.96
Selenium	Se	34	78.96
Silicon	Si	14	28.09
Silver	Ag	47	107.870
Sodium	Na	11	22.9898
Strontium	Sr	38	87.62
Sulfur	S	16	32.064
Tantalum	Ta	73	180.95
Technetium	Tc	43	(99)
Tellurium	Te	52	127.60
Terbium	Tb	65	158.92
Thallium	Tl	81	204.37
Thorium	Th	90	232.04
Thulium	Tm	69	168.93
Tin	Sn	50	118.69
Titanium	Ti	22	47.90
Tungsten	W	74	183.85
Uranium	U	92	238.03
Vanadium	V	23	50.94
Xenon	Xe	54	131.30
Ytterbium	Yb	70	173.04
Yttrium	Y	39	88.91
Zinc	Zn	30	65.37
Zirconium	Zr	40	91.22

Based on mass of C<sup>12</sup> at 12 000. Values in parentheses represent the most stable known isotopes for elements that do not occur naturally

## ELECTRON CONFIGURATIONS OF THE ELEMENTS

## 3.2.700

Row headings are Atomic numbers 1 through 103 in sequential order; column headings are: Orbitals (elements), 1s, 2s, 2p, 3s, 3p, 3d, 4s, 4p, 4d, 4f, 5s, 5p, 5d, 5f, 6s, 6p, 6d, 6f, 7s; entries under these headings are one- or two-digit values; note as to arrangement of table in braille version precedes table; 15 pages.

	Orbitals	1s	2s	2p	3s	3p	3d	4s	4p	4d	4f	5s	5p	5d	5f	6s	6p	6d	6f	7s
1	hydrogen	1																		
2	helium	2																		
3	lithium	2	1																	
4	beryllium	2	2																	
5	boron	2	2	1																
6	carbon	2	2	2																
7	nitrogen	2	2	3																
8	oxygen	2	2	4																
9	fluorine	2	2	5																
10	neon	2	2	6																
11	sodium	2	2	6		1														
12	magnesium	2	2	6		2														
13	aluminum	2	2	6		2	1													
14	silicon	2	2	6		2	2													
15	phosphorus	2	2	6		2	3													
16	sulfur	2	2	6		2	4													
17	chlorine	2	2	6		2	5													
18	argon	2	2	6	2	6														
19	potassium	2	2	6	2	6				1										
20	calcium	2	2	6	2	6				2										
21	scandium	2	2	6	2	6		1		2										
22	titanium	2	2	6	2	6		2		2										
23	vanadium	2	2	6	2	6		3		2										
24	chromium	2	2	6	2	6		5	1											
26	iron	2	2	6	2	6	6	2												
27	cobalt	2	2	6	2	6	7	2	1											
28	nickel	2	2	6	2	6	8	2												
29	copper	2	2	6	2	6	10	1												
30	zinc	2	2	6	2	6	10	2												
31	gallium	2	2	6	2	6	10	2	1											
32	germanium	2	2	6	2	6	10	2	2											
33	arsenic	2	2	6	2	6	10	2	3											
34	selenium	2	2	6	2	6	10	2	4											
35	bromine	2	2	6	2	6	10	2	5											
36	krypton	2	2	6	2	6	10	2	6											
37	rubidium	2	2	6	2	6	10	2	6					1						
38	strontium	2	2	6	2	6	10	2	6					2						
39	yttrium	2	2	6	2	6	10	2	6				1							
40	zirconium	2	2	6	2	6	10	2	6				2							
41	niobium	2	2	6	2	6	10	2	6				4							
42	molybdenum	2	2	6	2	6	10	2	6				5							
43	technetium	2	2	6	2	6	10	2	6				6							
44	ruthenium	2	2	6	2	6	10	2	6				7							
45	rhodium	2	2	6	2	6	10	2	6				8							
46	palladium	2	2	6	2	6	10	2	6				10							
47	silver	2	2	6	2	6	10	2	6				10							
48	cadmium	2	2	6	2	6	10	2	6				10							
49	indium	2	2	6	2	6	10	2	6				10							

## ELECTRON CONFIGURATIONS OF THE ELEMENTS

## 3.2.700 (Cont.)

	Orbitals	1s	2s	2p	3s	3p	3d	4s	4p	4d	4f	5s	5p	5d	5f	6s	6p	6d	6f	7s
50	tin	2	2	6	2	6	10	2	6	10	.	2	2							
51	antimony	2	2	6	2	6	10	2	6	10	.	2	3							
52	tellurium	2	2	6	2	6	10	2	6	10	.	2	4							
53	iodine	2	2	6	2	6	10	2	6	10	.	2	5							
54	xenon	2	2	6	2	6	10	2	6	10	.	2	6							
55	cesium	2	2	6	2	6	10	2	6	10	.	2	6						1	
56	barium	2	2	6	2	6	10	2	6	10	.	2	6					2		
57	lanthanum	2	2	6	2	6	10	2	6	10	.	2	6	1				2		
58	cerium	2	2	6	2	6	10	2	6	10	.	2	6					2		
59	praseodymium	2	2	6	2	6	10	2	6	10	.	3	2					2		
60	neodymium	2	2	6	2	6	10	2	6	10	.	4	2	6				2		
61	promethium	2	2	6	2	6	10	2	6	10	.	5	2	6				2		
62	samarium	2	2	6	2	6	10	2	6	10	.	6	2	6				2		
63	euroium	2	2	6	2	6	10	2	6	10	.	7	2	6				2		
64	gadolinium	2	2	6	2	6	10	2	6	10	.	7	2	6	1			2		
65	terbium	2	2	6	2	6	10	2	6	10	.	9	2	6				2		
66	dysprosium	2	2	6	2	6	10	2	6	10	.	10	2	6				2		
67	holmium	2	2	6	2	6	10	2	6	10	.	11	2	6				2		
68	erbium	2	2	6	2	6	10	2	6	10	.	12	2	6				2		
69	thulium	2	2	6	2	6	10	2	6	10	.	13	2	6				2		
70	ytterbium	2	2	6	2	6	10	2	6	10	.	14	2	6				2		
71	lutetium	2	2	6	2	6	10	2	6	10	.	14	2	6	1			2		
72	hafnium	2	2	6	2	6	10	2	6	10	.	14	2	6	2			2		
73	tantalum	2	2	6	2	6	10	2	6	10	.	14	2	6	3			2		
74	tungsten	2	2	6	2	6	10	2	6	10	.	14	2	6	4			2		
75	rhenium	2	2	6	2	6	10	2	6	10	.	14	2	6	5			2		
76	osmium	2	2	6	2	6	10	2	6	10	.	14	2	6	6			2		
77	iridium	2	2	6	2	6	10	2	6	10	.	14	2	6	7			2		
78	platinum	2	2	6	2	6	10	2	6	10	.	14	2	6	9			1		
79	gold	2	2	6	2	6	10	2	6	10	.	14	2	6	10			1		
80	mercury	2	2	6	2	6	10	2	6	10	.	14	2	6	10			2		
81	thallium	2	2	6	2	6	10	2	6	10	.	14	2	6	10			2	1	
82	lead	2	2	6	2	6	10	2	6	10	.	14	2	6	10			2	2	
83	bismuth	2	2	6	2	6	10	2	6	10	.	14	2	6	10			2	3	
84	polonium	2	2	6	2	6	10	2	6	10	.	14	2	6	10			2	4	
85	astatine	2	2	6	2	6	10	2	6	10	.	14	2	6	10			2	5	
86	radon	2	2	6	2	6	10	2	6	10	.	14	2	6	10			2	6	
88	radium	2	2	6	2	6	10	2	6	10	14	2	6	10		2	6		2	
89	actinium	2	2	6	2	6	10	2	6	10	14	2	6	10		2	6	1	2	
90	thorium	2	2	6	2	6	10	2	6	10	14	2	6	10		2	6	2	2	
91	protactinium	2	2	6	2	6	10	2	6	10	14	2	6	10		2	6	1	2	
92	uranium	2	2	6	2	6	10	2	6	10	14	2	6	10	3	2	6	1	2	
93	neptunium	2	2	6	2	6	10	2	6	10	14	2	6	10	4	2	6	1	2	
94	plutonium	2	2	6	2	6	10	2	6	10	14	2	6	10	6	2	6	2	2?	
95	americium	2	2	6	2	6	10	2	6	10	14	2	6	10	7	2	6	2	2?	
96	curium	2	2	6	2	6	10	2	6	10	14	2	6	10	7	2	6	1	2?	
97	berkelium	2	2	6	2	6	10	2	6	10	14	2	6	10	8	2	6	1	2?	
98	californium	2	2	6	2	6	10	2	6	10	14	2	6	10	10	2	6	2	2?	
99	einsteinium	2	2	6	2	6	10	2	6	10	14	2	6	10	11	2	6	2	2?	
100	fermium	2	2	6	2	6	10	2	6	10	14	2	6	10	12	2	6	2	2?	
101	mendelevium	2	2	6	2	6	10	2	6	10	14	2	6	10	13	2	6	1	2?	
102	nobelium	2	2	6	2	6	10	2	6	10	14	2	6	10	13	2	6	1	2?	
103	lawrencium	2	2	6	2	6	10	2	6	10	14	2	6	10	14	2	6	1	2?	

## DECOMPRESSION PROCEDURES

## 4.2.1

Procedures are followed by four tables as follows:

Table 1-5 U.S. Navy Standard Air Decompression Table

Headings: Depth, Bottom Time, Time to First Stop, Decompression Stops, Total Ascent Time, Repet. Group; row headings (Depth (ft)) ranges from 40 through 190 at intervals of 10 ft.; appropriate entries.

Table 1-6 Repetitive Dive Tables and Worksheet

Headings: Depth, No Decompression Limits, Repetitive Groups (this last having alphabetical headings A through O; column heading Depth has entries ranging from 10 through 40 at intervals of 5 ft., from 40 through 190 at intervals of 10 ft; No Decompression Limits are given in Minutes; appropriate entries.

Table 1-7 Surface Intervals Credit Table

Information given in hours and minutes.

Table 1-8 Repetitive Dive Timetable

Enlarges on the column in table 1-5 - Repet. Group: 30 pages.

## DECOMPRESSION PROCEDURES

## 4. PHYSICS

## 4.2.1

TABLE 1-5 U. S. NAVY STANDARD AIR DECOMPRESSION TABLE

DEPTH (ft)	BOTTOM TIME (min.)	TIME TO FIRST STOP	DECOMPRESSION STOPS	TOTAL ABSENT TIME			REPET. GROUP	DEPTH (ft)	BOTTOM TIME (min.)	TIME TO FIRST STOP	DECOMPRESSION STOPS	TOTAL ABSENT TIME	REPET. GROUP	
				50	40	30								
40	200	0.5		0	0.7	*		15				0	2.0	*
	210	0.5		2	2.6	N		20	1.6			2	3.6	H
	230	0.5		7	7.5	N		25	1.6			8	7.6	I
	250	0.5		11	11.6	O		30	1.6			14	15.6	J
	270	0.5		16	16.6	O		40	1.7			6	25	L
	300	0.5		7	7.6	Q	120	15			31	47.7	N	
60	70	1.2		23	24.2	M		60	1.6			4	51	B
	60	1.0		2	31	N		70	1.3			3	19	62
	60	1.0		7	39	N		80	1.7			11	39	111.6
	60	1.0		11	46	O			1	17			17	145.8
	60	1.0		13	53	O				19			64	172.7
	60	1.0		17	56	Z				60				Z
80	120	1.0		17	56	Z		10	2.5			0	2.7	D
	120	1.0		17	56	Z		15	2.3			1	3.5	F
	120	1.0		17	56	Z		15	2.3			4	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
100	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
110	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
130	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
140	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
150	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
160	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
170	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
180	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
190	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4
	120	1.0		17	56	Z		15	2.3			1	7.4	4

## **DECOMPRESSION PROCEDURES**

#### **4.2.1 (Cont.) REPETITIVE DIVE TABLES AND WORKSHEET**

TABLE 1-6 "NO DECOMPRESSION" LIMITS AND REPETITIVE GROUP DESIGNATION TABLE FOR "NO DECOMPRESSION" DIVES.

TABLE 1-7 SURFACE INTERVAL CREDIT TABLE

REPETITIVE GROUP AT THE END OF THE SURFACE INTERVAL																
	Z	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A
Z	0:10- 0:22	0:34	0:48	1:02	1:18	1:36	1:55	2:17	2:42	3:10	3:45	4:29	5:27	6:56	10:05	12:00*
	O	0:10- 0:23	0:36	0:51	1:07	1:24	1:43	2:04	2:29	2:59	3:33	4:17	5:16	6:44	9:54	12:00*

PREV

diagonal slope. Enter the table horizontally to select the listed surface interval time that is exactly or next greater than the actual surface interval time. The repetitive group designation for the end of the surface interval is at the head of the vertical column where the selected surface interval time is listed. For example - a previous dive was to 110 ft. for 30 minutes. The diver coming up from the surface 1 hour and 30 minutes and wishes

TABLE 1-8 REPETITIVE DIVE TIMETABLE

REPET. GROUPS	REPETITIVE DIVE DEPTH (Ft.)															
	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190
A	7	6	5	4	4	3	3	3	3	3	2	2	2	2	2	2
B	17	13	11	9	8	7	7	6	6	6	5	5	4	4	4	4
C	25	21	17	15	13	11	10	10	9	8	7	7	6	6	6	6
D	37	29	24	20	18	16	14	13	12	11	10	9	9	8	8	8
M	187	124	97	80	68	58	52	47	43	38	35	32	31	29	27	26
N	213	142	107	87	73	64	57	51	46	40	38	35	33	31	29	28
O	241	160	117	96	80	70	62	55	50	44	40	38	36	34	31	30
Z	257	189	122	100	84	73	64	57	52	46	42	40	37	35	32	31

Courtesy of the United States Navy

## 5. COMPUTER

### COMPUTER

#### SUBSTITUTES FOR NONEXISTENT CHARACTERS ON 2741 KEYBOARDS

##### 5.2.450

Column headings are: EBCDIC Character, APL Keyboard, Selectric Keyboard, EBCD Keyboard; a transcriber's note supplies certain graphics which do not appear in "Provisional Braille Code for Computer Notation 1972"; 2 pages.

EBCDIC Character	APL Keyboard	Selectric Keyboard	EBCD Keyboard
>	>	, (upper case)	>
<	<	. (upper case)	<
^	†	‡	‡
		° (degree)	
~	~	±	~
/	/	/	/
%	%	%	%
£	£	£	£
@	α	@	@
<hr/>			
I	o	I	I
&	n	&	&
\$	u	\$	\$

## ANSII CONTROL-CHARACTER TRANSLATION TABLE

5.2.475

## ANSII CONTROL-CHARACTER TRANSLATION TABLE

5.2.475

The two principal blocks are headed "Input" and "Output"; column headings under "Input" are: ANSCII, TTY Key, Echoed, Prog. Receives (EBCDIC), Process; column headings under "Output" are: EBCDIC, Transmitted (ANSII); a transcriber's note explains the rearrangement of the table in braille, and supplies the reference notes for explanation; 21 pages.

Input				Output			
ANSII	TTY Key	Echoed	Prog. Receives (EBCDIC)	Process	EBCDIC	Transmitted (ANSII)	
NUL (00)	pc\$	None	None	None	NUL (00)	Nothing (end of output message).	
SOH (01)†	A <sup>c</sup>	SOH	SOH	None	SOH (01)	SOH	
STX (02)†	B <sup>c</sup>	STX	STX	None	STX (02)	STX	
ETX (03)†	C <sup>c</sup>	ETX	ETX	None	ETX (03)	ETX	
EOT (04)†	D <sup>c</sup>	EOT	EOT	None	EOT (04)	EOT	
ENQ (05)†	E <sup>c</sup>	FNQ	FNQ (09)	None	HT (05)	Space(s) if rnb	
^S (1E)	N <sup>c</sup>	RS	RS	Input Complete	^S (1E)	RS	
US (1F)	O <sup>c</sup>	US	US	Input Complete	US (1F)	US	
} (7D)	ALT-MODE	} or None	} or None	{ if model 37; as ESC if model 33, 35, or 7015. ~ if model 37; as ESC if model 33, 35, or 7015.	} (83)	} (7D)	
~ (7E)	ESC (7015)	~or None	~or None	~(5F)	~(7E)		
DEL (7F)	Rubout	\	None	Rubout last character.	DEL (FF)	None	

## UTS 7-Bit COMMUNICATION CODES (ANSCII)

## 5.2.500

Rows are headed "Least Significant Digits", and columns are headed "Most Significant Digits"; these digits are shown both in decimal form and binary form; row headings range from 0 through 15 in decimal form or 0000 through 1111 in binary form; column headings range from 0 through 7 in decimal form, 000 through 111 in binary form; entries are the names or the graphics ANSCII 7-Bit Communication Code used in Universal Time Sharing; reference notes of explanation are included; a transcriber's note precedes the table to explain the arrangement of the braille version and to present a few graphics which do not appear in the "Provisional Braille Code for Computer Notation 1972" and the NBA "Presentation and Outcome of the Computer Notation Workshop" San Francisco, 1973; 7 pages.

		Most Significant Digits								
Decimal (rows) (col's.)		0	1	2	3	4	5	6	7	
	Binary	x000	x001	x010	x011	x100	x101	x110	x111	
0	0000	NUL	DLE	SP	0	@	P	‘	P	
1	0001	SOH	DC1	I	1	A	Q	‘	Q	
2	0010	STX	DC2	”	2	B	R	b	r	
3	0011	ETX	DC3	#	3	C	S	c	s	
Least Significant Digits	5	0101	ENQ	NAK	%	5	E	U	•	u
	6	0110	ACK	SYN	&	6	F	V	f	v
	7	0111	BEL	ETB	’	7	G	W	g	w
	8	1000	BS	CAN	(	8	H	X	h	x
	9	1001	HT	EM	)	9	I	Y	i	y
	10	1010	LF	NL	SUB	:	J	Z	j	z
	11	1011	VT	ESC	+	;	K	[	k	{
	12	1100	FF	FS	,	<	L	\	l	‘
	13	1101	CR	GS	-	=	M	]	m	^
	14	1101	SO	RS	.	>	N	~	n	~
	15	1111	SI	US	/	?	O	-	o	DEL

2

3

## UTS 8-Bit COMPUTER CODES (EBCDIC)

## 5.2.525

Rows are headed "Least Significant Digits", and columns are headed "Most Significant Digits"; these digits are shown both in hexadecimal and binary form; in hexadecimal form, digits range from 0 through F for both row and column headings; entries are the names or the graphics of the EBCDIC 8-Bit Computer Codes used in Universal Time Sharing; reference notes of explanation are included; a transcriber's note precedes the table to explain the arrangement of the braille version, and to present a few graphics which do not appear in the "Provisional Braille Code for Computer Notation 1972" or in the "Presentation and Outcome of the Computer Notation Workshop" San Francisco, 1973; 14 pages.

		Most Significant Digits																
Hexadecimal		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
	Binary	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111	
Digits	0	0000	NUL	DLE	LF only	ESC F	SP	&	-	A					SP	-	0	
	1	0001	SOH	X-ON	FS	CAN	7	8	9	..	a	i		\	A	J	1	
	2	0010	STX	DC2	GS	ESC X	1	2	3	4	b	k	s	{	B	K	S	2
	3	0011	ETX	X-OFF	RS	ESC P	5	6	7	8	c	l	t	}	C	L	T	3
	4	0100	EOT	DC4	US	ESC U	9	0	1	≤	d	m	u	[	D	M	U	4
	5	0101	HT	LF NL	EM	ESC (	€	7	8	9	e	n	v	]	E	N	V	5
	6	0110	ACK	SYN	/	ESC )	0	1	2	≥	f	o	w		F	O	W	6

Least Signifi	8	1000	EOM BS	CAN	=	ESC S	Δ			h	q	y		H	Q	Y	8
	9	1001	ENQ	EM	CR only	ESC E	?			v	i	r	z	I	R	Z	9
	A	1010	NAK	SUB	EOT	ESC C	2	!	~	:				7	8	9	A
	B	1011		VT	ESC	BS	ESC LF	.	\$	,	#			;	;	;	B
	C	1100	.	FF	FS	)	X-ON	<	*	%	@			[	;	;	C
	D	1101		CR	GS	HT	X-OFF	(	)	_	'			]	;	;	D
	E	1110		SO	RS	LF only	ESC R	+	;	>	=			Last Data	;	;	E
	F	1111		SI	US	SUB	ESC CR		2	~	?	"		6		~	DEL

3            6            4,7            5

## UTS SYMBOL-CODE CORRESPONDENCES

5.2.550

5.2.550

Column headings are: EBCDIC (Hex.), EBCDIC (Dec.), Symbol, Card Code, ASCII, Meaning, Remarks; in hexidecimal form. EBCDIC codes range from 00 through FF; the table has been rearranged for braille transcription; a transcriber's note is included to note this arrangement, and to present a few graphics which do not appear in the "Provisional Braille Code for Computer Notation 1972" and the NFA "Presentation and Outcome of the Computer Notation Workshop" San Francisco, 1973: 88 pages.

EBCDIC <sup>c</sup> Hex.	Dec.	Symbol	Card Code	ANSI <sup>d</sup>	Meaning	Remarks
00	0	NULL	12-0-9-8-1	0-0	null	00 through 1F are control codes. On 2741 terminals, SOH is PRE.
01	1	SOH	12-9-1	0-1	start of header	On 2741 terminals, SOH is PRE.
02	2	STX	12-9-2	0-2	start of text	On 2741 terminals, STX is BY.
03	3	ETX	12-9-3	0-3	end of text	On 2741 terminals, ETX is RES.
04	4	EOT	12-9-4	0-4	end of transmission	
05	5	HT	12-9-5	0-9	horizontal tab	00, 0b, 07, 09-0B, and 0E-0F are idles for 2741 terminals.
06	6	ACK	12-9-6	0-6	acknowledge (positive)	
07	7	BEL	12-9-7	0-7	bell	
08	8	BS or EOM	12-9-8	0-8	backspace or end of message	EOM is used only on Xerox Keyboard/ Printers Models 7012, 7020, 8091, and 8092.
09	9	ENQ	12-9-8-1	0-5	enquiry	
0A	10	NAK	12-9-8-2	1-5	negative acknowledge	
0B	11	VT	12-9-8-3	0-11	vertical tab	
0C	12	FF	12-9-8-4	0-12	form feed	
0D	13	CR	12-9-8-5	0-13	carriage return	CR outputs CR and LF.
0E	14	SO	12-9-8-6	0-14	shift out	
0F	15	SI	12-9-8-7	0-15	shift in	
10	16	DLE	12-11-9-8-1	1-0	data link escape	
11	17	DC1	11-9-1	1-1	device control 1	On Teletype terminals, DC1 is X-ON.
12	18	DC2	11-9-2	1-2	device control 2	On 2741 terminals, DC2 is PN.
13	19	DC3	11-9-3	1-3	device control 3	DC3 is RS on 2741s and X-OFF on Teletypes.
14	20	DC4	11-9-4	1-4	device control 4	On 2741 terminals, DC4 is PE.
15	21	LF or NL	11-9-5	0-10	line feed or new line	LF outputs CR and LF.
16	22	SYN	11-9-6	1-6	sync	On 2741 terminals, ETB is ECB.
17	23	ETB	11-9-7	1-7	end of transmission block	
18	24	CAN	11-9-8	1-8	cancel	
19	25	EM	11-9-8-1	1-9	end of medium	
1A	26	SUB	11-9-8-2	1-10	substitute	
1B	27	ESC	11-9-8-3	1-11	escape	Replaces characters with parity error.
1C	28	FS	11-9-8-4	1-12	file separator	
1D	29	RS	11-9-8-5	1-13	record separator	

Table 5.2.550 (Cont.)

UTS SYMBOL-CODE CORRESPONDENCES  
5.2.550 (Cont.)

81 129 82 130 83 131 84 132 85 133 86 134		12-0-1 12-0-2 12-0-3 12-0-4 12-0-5 12-0-6	
		6-1 6-2 6-3 6-4 6-5 6-6	
E0	224	0-8-2	minus
E1	225	11-0-9-1	2-13
E2	226	0-2	
E3	227	0-3	
E4	228	0-4	
E5	229	0-5	
E6	230	0-6	
E7	231	0-7	
E8	232	0-8	
E9	233	0-9	
EA	234	11-0-9-8-2	
EB	235	11-0-9-8-3	
EC	236	11-0-9-8-4	
ED	237	11-0-9-8-5	
EE	238	11-0-9-8-6	
EF	239	11-0-9-8-7	
F0	240	0	
F1	241	1	
F2	242	2	
F3	243	3	
F4	244	4	
F5	245	5	
F6	246	6	
F7	247	7	
F8	248	8	
F9	249	9	
FA	250	X	12-11-0-9-8-2
FB	251	+	12-11-0-9-8-3
FC	252	-	12-11-0-9-8-4
FD	253	-	12-11-0-9-8-5
FE	254	DEL	12-11-0-9-8-6
FF	255		12-11-0-9-8-7

81-89, 91-99, A2-A9 comprise the lowercase alphabet. Available only in Xerox standard 89- and 95-character sets.

Output only. E1 is unassigned.

EA through FF are unassigned.

FA through FF are APL characters for 271 APL use only.

FE is not assigned.  
Special - neither graphic nor control symbol.

minus  
multiply  
divide  
right arrow  
left arrow  
delete

## 6. BUSINESS, FINANCE

### BUSINESS, FINANCE

#### COMPOUND SUM OF \$1

##### 6.1.1322

Column headings are: Period, 1%, 2%, 3%, 4%, 5%, 6%, 7%; row headings under Period range from 1 through 20 at intervals of 1, followed by 25, 30; entries are generally to three decimal places; 14 pages.

Period	1%	2%	3%	4%	5%	6%	7%
1	1.010	1.020	1.030	1.040	1.050	1.060	1.070
2	1.020	1.040	1.061	1.082	1.102	1.124	1.145
3	1.030	1.061	1.093	1.125	1.158	1.191	1.225
4	1.041	1.082	1.126	1.170	1.216	1.262	1.311
5	1.051	1.104	1.159	1.217	1.276	1.338	1.403
25	1.282	1.641	2.094	2.666	3.386	4.292	5.427
30	1.348	1.811	2.427	3.243	4.322	5.743	7.612

Period	8%	9%	10%	12%	14%	15%	16%
1	1.080	1.090	1.100	1.120	1.140	1.150	1.160
2	1.166	1.188	1.210	1.254	1.300	1.322	1.346
3	1.260	1.295	1.331	1.405	1.482	1.521	1.561
4	1.360	1.412	1.464	1.574	1.689	1.749	1.811
5	1.469	1.539	1.611	1.762	1.925	2.011	2.100
25	6.848	8.623	10.835	17.000	26.462	32.919	40.874
30	10.063	13.268	17.449	29.960	50.950	66.212	85.850

Period	18%	20%	24%	28%	32%	36%
1	1.180	1.200	1.240	1.280	1.320	1.360
2	1.392	1.440	1.538	1.638	1.742	1.850
3	1.643	1.728	1.907	2.067	2.300	2.515
4	1.939	2.074	2.364	2.684	3.036	3.421
5	2.288	2.488	2.932	3.436	4.007	4.653
25	62.669	95.396	216.542	478.90	1033.6	2180.1
30	143.371	237.376	634.820	1645.5	4142.1	10143.

Period	40%	50%	60%	70%	80%	90%
1	1.400	1.500	1.600	1.700	1.800	1.900
2	1.960	2.250	2.560	2.890	3.240	3.610
3	2.744	3.375	4.096	4.913	5.832	6.859
4	3.842	5.062	6.544	8.352	10.498	13.032
5	5.378	7.594	10.486	14.199	18.896	24.761
25	4499.880	25251.	126780.0	577060.0	2408900.	9307600.0
30	24201.432	191750.	1329200.	8193500.0	45517000.	230470000.0

## COMPOUND SUM OF 1

## 6.1.1422

Headings are: Periods,  $\frac{1}{2}\%$ ,  $1\%$ ,  $1\frac{1}{2}\%$ ,  $2\%$ ,  $3\%$ ,  $4\%$ ,  $5\%$ ,  $6\%$ ; row headings under Period range from 1 through 20 at intervals of 1, followed by 25, 30; entries are tabulated to four decimals; 4 pages.

Yrs/Periods	$\frac{1}{2}\%$	$1\%$	$1\frac{1}{2}\%$	$2\%$	$3\%$	$4\%$	$5\%$	$6\%$
1	1.0050	1.0100	1.0150	1.0200	1.0300	1.0400	1.0500	1.0600
4	1.0202	1.0406	1.0614	1.0824	1.1255	1.1699	1.2155	1.2625
5	1.0253	1.0510	1.0773	1.1041	1.1593	1.2167	1.2763	1.3382
6	1.0304	1.0615	1.0934	1.1262	1.1941	1.2653	1.3401	1.4185
7	1.0355	1.0721	1.1098	1.1487	1.2299	1.3159	1.4071	1.5036
8	1.0407	1.0829	1.1265	1.1717	1.2668	1.3686	1.4775	1.5939
9	1.0459	1.0937	1.1434	1.1951	1.3048	1.4233	1.5513	1.6895
10	1.0511	1.1046	1.1605	1.2190	1.3439	1.4802	1.6289	1.7909
11	1.0564	1.1157	1.1779	1.2434	1.3842	1.5395	1.7103	1.8983
12	1.0617	1.1268	1.1956	1.2682	1.4258	1.6010	1.7959	2.0122
13	1.0670	1.1381	1.2136	1.2936	1.4685	1.6651	1.8856	2.1329
14	1.0723	1.1495	1.2318	1.3195	1.5126	1.7317	1.9799	2.2609
15	1.0777	1.1610	1.2502	1.3459	1.5580	1.8009	2.0789	2.3966
16	1.0831	1.1726	1.2690	1.3728	1.6047	1.8730	2.1829	2.5404
17	1.0885	1.1843	1.2880	1.4002	1.6528	1.9479	2.2920	2.6928
18	1.0939	1.1961	1.3073	1.4282	1.7024	2.0258	2.4066	2.8543
19	1.0994	1.2081	1.3270	1.4568	1.7535	2.1068	2.5270	3.0256
20	1.1049	1.2202	1.3469	1.4859	1.8061	2.1911	2.6533	3.2071
25	1.1328	1.2824	1.4509	1.6406	2.0938	2.6658	3.3864	4.2919
50	1.2832	1.6446	2.1052	2.6916	4.3839	7.1067	11.4674	18.4202

AMOUNT OF 1  
6.1.1540

AMOUNT OF 1

6.1.1540

Column headings are: Period,  $\frac{1}{2}\%$ ,  $2\%$ ,  $2\frac{1}{2}\%$ ,  $3\%$ ,  $3\frac{1}{2}\%$ ,  $4\%$ ,  $5\%$ ,  $6\%$ ,  $8\%$ ; row headings under Period range from 1 through 40 at intervals of 1; entries are tabulated to five decimal places; 9 pages.

Period	$s = (1 + i)^n$					
	1 1/2%	2%	2 1/2%	3%	3 1/2%	4%
1	1.01500	1.02000	1.02500	1.03000	1.03500	1.04000
2	1.03023	1.04040	1.05063	1.06090	1.07123	1.08160
3	1.04568	1.06121	1.07689	1.09273	1.10872	1.12486
4	1.06136	1.08243	1.10381	1.12551	1.14752	1.16986
5	1.07728	1.10408	1.13141	1.15927	1.18769	1.21665
6	1.09344	1.12616	1.15969	1.19405	1.22926	1.26532
7	1.10984	1.14869	1.18869	1.22987	1.27228	1.31593
8	1.12649	1.17166	1.21840	1.26677	1.31681	1.36857
9	1.14339	1.19509	1.24886	1.30477	1.36290	1.42331
10	1.16054	1.21899	1.28008	1.34392	1.41060	1.48024
						1.62889
						1.79085
						2.15892
30	1.56308	1.81136	2.09757	2.42726	2.80679	3.24340
31	1.58653	1.84759	2.15001	2.50008	2.90503	3.37313
32	1.61032	1.88454	2.20376	2.57508	3.00671	3.50806
33	1.63448	1.92223	2.25885	2.65234	3.11194	3.64838
34	1.65900	1.96068	2.31532	2.73191	3.22086	3.79432
35	1.68388	1.99989	2.37321	2.81386	3.33359	3.94609
36	1.70914	2.03989	2.43254	2.89828	3.45027	4.10393
37	1.73478	2.08069	2.49335	2.98523	3.57103	4.26809
38	1.76080	2.12230	2.55568	3.07478	3.69601	4.43881
39	1.78721	2.16474	2.61957	3.16703	3.82537	4.61637
40	1.81402	2.20804	2.68506	3.26204	3.95926	4.80102

COMPOUND AMOUNT OF 1  $(1+i)^n$ 

## 6.1.1550

Row headings (n) range from 1 through 50 at intervals of 1; column headings (interest rates) are:  $1/2\%$ ,  $1\%$ ,  $1\frac{1}{2}\%$ ,  $2\%$ ,  $3\%$ ,  $4\%$ ,  $5\%$ ,  $6\%$ ; entries are tabulated to five decimal places; 7 pages.

$n$	$\frac{1}{2}\%$	$1\%$	$1\frac{1}{2}\%$	$2\%$	$3\%$	$4\%$	$5\%$	$6\%$
1	1.005 00	1.010 00	1.015 00	1.020 00	1.030 00	1.040 00	1.050 00	1.060 00
2	1.010 02	1.020 10	1.030 22	1.040 40	1.060 90	1.081 60	1.102 50	1.123 60
3	1.015 08	1.030 30	1.045 68	1.061 21	1.092 73	1.124 86	1.157 62	1.191 02

47	1.264 17	1.596 26	2.013 28	2.536 34	4.011 90	6.317 82	9.905 97	15.465 92
48	1.270 49	1.612 23	2.043 48	2.587 07	4.132 25	6.570 53	10.401 27	16.393 87
49	1.276 84	1.628 35	2.074 13	2.638 81	4.256 22	6.833 35	10.921 33	17.377 50
50	1.283 23	1.644 63	2.105 24	2.691 59	4.383 91	7.106 68	11.467 40	18.420 15

COMPOUND AMOUNT OF 1  $(1+i)^n$ 

## 6.1.16100

Row headings (n) range from 1 through 100 at intervals of 1; column headings are:  $5/12\%$ ,  $1/2\%$ ,  $7/12\%$ ,  $3/4\%$ ,  $1\%$ ,  $1-1/8\%$ ,  $1-1/4\%$ ,  $1-1/2\%$ ,  $1-3/4\%$ ,  $2\%$ ,  $3\%$ ,  $4\%$ ,  $5\%$ ,  $6\%$ ,  $7\%$ ; entries are tabulated to six decimal places; 28 pages.

$n$	$\frac{5}{12}\%$	$\frac{1}{2}\%$	$\frac{7}{12}\%$	$\frac{3}{4}\%$	$1\%$
1	1.004 167	1.005 000	1.005 833	1.007 500	1.010 000
2	1.008 351	1.010 025	1.011 701	1.015 056	1.020 100
3	1.012 552	1.015 075	1.017 602	1.022 669	1.030 301

97	1.496 796	1.622 213	1.758 022	2.064 288	2.625 266
98	1.503 033	1.630 324	1.768 277	2.079 770	2.651 518
99	1.509 296	1.638 776	1.778 592	2.095 369	2.678 033
100	1.515 584	1.646 668	1.788 967	2.111 084	2.704 814

$n$	$1\frac{1}{8}\%$	$1\frac{1}{4}\%$	$1\frac{1}{2}\%$	$1\frac{3}{4}\%$	$2\%$
1	1.011 250	1.012 500	1.015 000	1.017 500	1.020 000
2	1.022 627	1.025 156	1.030 225	1.035 306	1.040 400
3	1.034 131	1.037 971	1.045 678	1.053 424	1.061 208

97	2.959 906	3.336 707	4.238 441	5.380 697	6.826 792
98	2.993 205	3.378 416	4.302 017	5.474 859	6.963 328
99	3.026 878	3.420 646	4.366 547	5.570 669	7.102 594
100	3.060 930	3.463 404	4.432 046	5.668 156	7.244 646

$n$	$3\%$	$4\%$	$5\%$	$6\%$	$7\%$
1	1.030 000	1.040 000	1.050 000	1.060 000	1.070 000
2	1.060 900	1.081 600	1.102 500	1.123 600	1.144 900
3	1.092 727	1.124 864	1.157 625	1.191 016	1.225 043
4	1.125 509	1.169 859	1.215 506	1.262 477	1.310 796

97	17.587 771	44.898 715	113.595 731	284.884 572	708.314 994
98	18.115 404	46.694 664	119.275 517	301.977 646	757.897 044
99	18.658 866	48.562 450	125.239 293	320.096 305	810.949 837
100	19.218 632	50.504 948	131.501 258	339.302 084	867.716 326

## AMOUNT OF \$1 AT COMPOUND INTEREST

## 6.1.1729

Headings are: Periods,  $1\frac{1}{2}\%$ , 2%, 3%, 4%, 6%, 8%; row headings under Periods range from 1 through 20 at intervals of 1, from 20 through 30 at intervals of 5, from 30 through 100 at intervals of 10; entries are tabulated to seven decimal places; 4 pages..

Interest Periods	$1\frac{1}{2}\%$	2%	3%	4%	6%	8%
1	1.0150000	1.0200000	1.0300000	1.0400000	1.0600000	1.0800000
2	1.0302250	1.0404000	1.0609000	1.0816000	1.1236000	1.1664000
3	1.0456784	1.0612080	1.0927270	1.1248640	1.1910160	1.2597120
4	1.0613636	1.0824322	1.1255088	1.1698586	1.2624770	1.3604890
5	1.0772840	1.1040808	1.1592741	1.2166529	1.3382256	1.4693281
20	1.3468550	1.4859474	1.8061112	2.1911231	3.2071355	4.6609571
25	1.4509454	1.6406060	2.0937779	2.6658363	4.2918707	6.8484752
30	1.5630802	1.8113616	2.4272625	3.2433975	5.7434912	10.0626569
80	3.2906628	4.8754392	10.6408906	23.0497991	105.7959935	471.9548343
90	3.8189485	5.9431331	14.3004671	34.1193333	189.4645112	1018.9150893
100	4.4320457	7.2446461	19.2186320	50.5049482	339.3020835	2199.7612563

## AMOUNT OF ANNUITY OF \$1 AT COMPOUND INTEREST

## 6.1.1729A

Headings are: Periods,  $1\frac{1}{2}\%$ , 2%, 3%, 4%, 6%, 8%; row headings under Periods range from 1 through 20 at intervals of 1, 20 through 30 at intervals of 5, from 30 through 100 at intervals of 10; entries are tabulated to seven decimal places; 5 pages.

Interest Periods	$1\frac{1}{2}\%$	2%	3%	4%	6%	8%
1	1.0150000	1.0200000	1.0300000	1.0400000	1.0600000	1.0800000
2	2.0452250	2.0604000	2.0909000	2.1216000	2.1836000	2.2464000
3	3.0909034	3.1226080	3.1836270	3.2464640	3.3746160	3.5061120
4	4.1522669	4.2040402	4.3091358	4.4163226	4.6370930	4.8666010
5	5.2295509	5.3081210	5.4684099	5.6329755	5.9753186	6.3359290
20	23.4705221	24.7833172	27.6764857	30.9692017	38.9927267	49.4229214
25	30.5139690	32.6709057	37.5530423	43.3117446	58.1563827	78.9544152
30	38.1017616	41.3794408	49.0026782	58.3283353	83.8016774	122.3458680
80	155.0015153	197.6473970	331.0039091	573.2947758	1852.3958849	6357.8902626
90	190.7488489	252.0997894	456.6493708	861.1026669	3329.5396984	13741.8537053
100	232.2350889	318.4769511	625.5063619	1287.1286528	5976.6701421	29682.2769606

AMOUNT AT COMPOUND INTEREST  $(1+i)^n$ 

6.1.18100

Periods (n) range from 1 through 100 at intervals of 1; under Rate i, subheadings are: .0025(1/4%), .004167(5/12%), .005(1/2%), .005833(7/12%), .0075(3/4%), .01(1%), .01125(1-1/8%), .0125(1-1/4%), .015(1-1/2%), .0175(1-3/4%), .02(2%), .0225(2-1/4%), .025(2-1/2%), .0275(2-3/4%), .03(3%); Periods (n) range from 1 through 50 at intervals of 1 for Rates: .035(3-1/2%), .04(4%), .045(4-1/2%), .05(5%), .055(5-1/2%), .06(6%), .065(6-1/2%), .07(7%), .075(7-1/2%), .08(8%); all entries are tabulated to eight decimal places: 60 pages.

n	.0025(1/4%)	.004167(5/12%)	.005(1/2%)	.005833(7/12%)	.0075(3/4%)	.01(1%)	.01125(1-1/8%)	.0125(1-1/4%)	.015(1/2%)	.0175(1-3/4%)
1	1.0025 0000	1.0041 6667	1.0050 0000	1.0058 3333	1.0075 0000	1	1.0100 0000	1.0112 5000	1.0125 0000	1.0150 0000
2	1.0050 0625	1.0083 5069	1.0100 2500	1.0117 0669	1.0150 6625	2	1.0201 0000	1.0226 2656	1.0251 5625	1.0302 2500
3	1.0075 1877	1.0125 5216	1.0150 7513	1.0176 0228	1.0226 6917	3	1.0303 0100	1.0341 3111	1.0379 7070	1.0456 7838

n	.02(2%)	.0225(24%)	.025(24%)	.0275(24%)	.03(3%)
1	1.0200 0000	1.0225 0000	1.0250 0000	1.0275 0000	1.0300 0000
2	1.0404 0000	1.0455 0625	1.0506 2500	1.0557 5625	1.0609 0000
3	1.0612 0800	1.0690 3014	1.0768 9063	1.0847 8955	1.0927 2700

n	98	99	100	98	99	100	98	99	100	98	99	100
98	6.9633 2768	8.8612 6871	11.2444 6530	14.2764 2255	18.1154 0388							
99	7.1025 9423	9.0504 1203	11.5255 7693	14.6690 2417	18.6588 6660							
100	7.2446 4612	9.2540 4630	11.8137 1635	15.0724 2234	19.2186 3198							

n	.03(3%)	.04(4%)	.045(44%)	.05(5%)	.055(54%)	n	.06(6%)	.065(64%)	.07(7%)	.075(74%)	.08(8%)
1	1.0350 0000	1.0400 0000	1.0450 0000	1.0500 0000	1.0550 0000	1	1.0600 0000	1.0650 0000	1.0700 0000	1.0750 0000	1.0800 0000
2	1.0712 2500	1.0816 0000	1.0920 2500	1.1025 0000	1.1130 2500	2	1.1236 0000	1.1342 2500	1.1449 0000	1.1556 2500	1.1664 0000
3	1.1087 1788	1.1248 6400	1.1411 6613	1.1576 2500	1.1742 4138	3	1.1910 1600	1.2079 4963	1.2250 4300	1.2422 9688	1.2597 1200

48	5.2135 8898	6.5705 2824	8.2714 5557	10.4012 6017	48	16.3938 7173	20.5485 4961	25.7289 0651	32.1816 0008	40.2105 7314
49	5.3960 6459	6.8333 4937	8.6436 7107	10.9213 3313	49	17.3775 0403	21.8842 0533	27.5299 2997	34.5951 1259	43.4274 1899
50	5.6549 2686	7.1066 8335	9.0326 3627	11.4673 9979	50	18.4201 5427	23.3066 7868	29.4570 2568	37.1897 4603	46.9016 1251

### PRESENT VALUE OF \$1

6-1-2322

## PRESENT VALUE OF \$1

6.1.2322

Column headings are: Period, 1%, 2%, 3%, 4%, 5%, 6%, 7%, 8%, 9%, 10%, 12%, 14%, 15%, 16%, 18%, 20%. 24%, 28%, 32%, 36%, 40%, 50%, 60%, 70%, 80%, 90%; row headings under Period range from 1 through 20 at intervals of 1, followed by 25, 30; entries are tabulated to three decimal places; 10 pages.

25	.780	.610	.478	.375	.295	.233	.184	.146	.116	.092	.059	.038	.030	25	.024	.016	.010	.005	.002	.001	.000
30	.742	.552	.412	.308	.231	.174	.131	.099	.075	.057	.033	.020	.015	30	.012	.007	.004	.002	.001	.000	.000

PRESENT VALUE OF \$1  $(1+r)^{-n}$

6.1.2350

Row headings under  $n$  range from 1 through 30 at intervals of 1, followed by 40, 50; column headings are: 1%, 2%, 4%, 6%, 8%, 10%, 12%, 14%, 15%, 16%, 18%, 20%, 22%, 24%, 25%, 26%, 28%, 30%, 35%, 40%, 45%, 50%; entries are tabulated to three decimal places; 8 pages.

Years Hence	1%	2%	3%	4%	5%	6%	7%	8%	10%	12%	14%	15%	16%	18%	20%	21%	22%	24%	25%	26%	28%	30%	35%	40%	45%	50%
1.....	0.990	0.980	0.961	0.943	0.926	0.909	0.891	0.877	0.870	0.862	0.847	0.831	0.815	0.806	0.800	0.794	0.781	0.769	0.754	0.741	0.714	0.690	0.667	0.644	0.621	
2.....	0.980	0.961	0.939	0.909	0.877	0.837	0.807	0.769	0.735	0.705	0.676	0.647	0.618	0.589	0.559	0.539	0.510	0.486	0.460	0.436	0.406	0.376	0.346	0.316	0.286	0.256
3.....	0.971	0.942	0.905	0.859	0.840	0.794	0.751	0.712	0.675	0.638	0.602	0.569	0.531	0.524	0.512	0.500	0.477	0.455	0.433	0.410	0.387	0.350	0.301	0.260	0.226	0.198
4.....	0.961	0.924	0.885	0.835	0.792	0.735	0.683	0.636	0.592	0.537	0.552	0.516	0.482	0.451	0.421	0.410	0.397	0.373	0.350	0.328	0.301	0.271	0.231	0.196	0.162	0.132
5.....	0.951	0.906	0.822	0.747	0.681	0.621	0.567	0.519	0.497	0.437	0.476	0.402	0.370	0.341	0.328	0.315	0.291	0.269	0.233	0.186	0.156	0.122	0.102	0.072	0.042	

PRESENT VALUE OF 1<sup>n</sup>

## 6.1.2540

Column headings are: Period,  $1\frac{1}{2}\%$ , 2%,  $2\frac{1}{2}\%$ , 3%,  $3\frac{1}{2}\%$ , 4%, 5%, 6%, 8%;  
 Periods range from 1 through 40 at intervals of 1; entries are tabulated to five decimal places; 9 pages.

$$v^n = \frac{1}{(1+i)^n} = (1+i)^{-n}$$

Period	$1\frac{1}{2}\%$	2%	$2\frac{1}{2}\%$	3%	$3\frac{1}{2}\%$	4%	5%	6%	8%
1	.98522	.98039	.97561	.97087	.96618	.96154	.95238	.94340	.92593
2	.97066	.96117	.95181	.94260	.93351	.92456	.90703	.89000	.85734
3	.95632	.94232	.92860	.91514	.90194	.88900	.86384	.83962	.79383
4	.94218	.92385	.90595	.88849	.87144	.85480	.82270	.79209	.73503
5	.92826	.90573	.88385	.86261	.84197	.82193	.78353	.74726	.68058

36	.58509	.49022	.41109	.34503	.28983	.24367	.17266	.12274	.06262
37	.57644	.48061	.40107	.33498	.28003	.23430	.16444	.11579	.05799
38	.56792	.47119	.39128	.32523	.27056	.22529	.15661	.10924	.05369
39	.55953	.46195	.38174	.31575	.26141	.21662	.14915	.10306	.04971
40	.55126	.45289	.37243	.30656	.25257	.20829	.14205	.09722	.04603

Present Value of  $1^n$   $(1+i)^{-n}$  (Compound Discount)

## 6.1.2550

Column headings are: n, i; under n, row headings range from 1 through 50 at intervals of 1; under i, column headings are: 1/2%, 1%,  $1\frac{1}{2}\%$ , 2%, 3%, 4%, 5%, 6%; entries are tabulated to five decimal places; 7 pages.

$\frac{n}{i}$	1/2%	1%	1 1/2%	2%	3%	4%	5%	6%
1	0.995 02	0.990 10	0.985 22	0.980 39	0.970 87	0.961 54	0.952 38	0.943 40
2	0.990 07	0.980 30	0.970 66	0.961 17	0.942 60	0.924 56	0.907 03	0.890 00
3	0.985 15	0.970 59	0.956 32	0.942 32	0.915 14	0.889 00	0.863 84	0.839 62
4	0.980 25	0.960 98	0.942 18	0.923 85	0.888 49	0.854 80	0.822 70	0.792 09
5	0.975 37	0.951 47	0.928 26	0.905 73	0.862 61	0.821 93	0.783 53	0.747 26

46	0.794 99	0.632 73	0.504 15	0.402 15	0.256 74	0.164 61	0.106 00	0.068 54
47	0.791 03	0.626 46	0.496 70	0.394 27	0.249 26	0.158 28	0.100 95	0.064 66
48	0.787 10	0.620 26	0.489 36	0.386 54	0.242 00	0.152 19	0.096 14	0.061 00
49	0.783 18	0.614 12	0.482 13	0.378 96	0.234 95	0.146 34	0.091 56	0.057 55
50	0.779 29	0.608 04	0.475 00	0.371 53	0.228 11	0.140 71	0.087 20	0.054 29

PRESENT VALUE OF  $1^r (1+r)^{-n}$

6.1.26100

Row headings under n range from 1 through 100 at intervals of 1; column headings are:  $5/12\%$ ,  $1/2\%$ ,  $7/12\%$ ,  $3/4\%$ ,  $1\%$ ,  $1-1/8\%$ ,  $1-1/4\%$ ,  $1-1/2\%$ ,  $1-3/4\%$ ,  $2\%$ ,  $3\%$ ,  $4\%$ ,  $5\%$ ,  $6\%$ ,  $7\%$ ; entries are to six decimal places, but the decimal point and a preceding zero are omitted in braille version of table; 22 pages.

n	$\frac{5}{12}\%$	$\frac{1}{2}\%$	$\frac{7}{12}\%$	$\frac{3}{4}\%$	1%
1	0.995 851	0.995 025	0.994 200	0.992 556	0.990 099
2	0.991 718	0.990 075	0.984 435	0.985 167	0.980 296
3	0.987 603	0.985 149	0.982 702	0.977 833	0.970 590
4	0.983 506	0.980 248	0.977 003	0.970 554	0.960 980
5	0.979 425	0.975 371	0.971 337	0.963 329	0.951 466
6	0.975 341	0.970 511	0.966 774	0.959 158	0.942 704
94	0.645 610	0.622 622	0.576 511	0.444 222	0.385 511
95	0.670 877	0.619 524	0.572 139	0.488 062	0.384 723
96	0.668 094	0.616 442	0.568 821	0.484 428	0.380 914
97	0.665 321	0.613 375	0.565 522	0.480 822	0.377 142
98	0.662 561	0.610 323	0.562 242	0.477 243	0.373 408
99	0.659 812	0.607 287	0.558 982	0.473 690	0.369 711
100	0.659 812	0.607 287	0.558 982	0.473 690	0.369 711

n	$1\frac{1}{8}\%$	$1\frac{1}{4}\%$	$1\frac{1}{2}\%$	$1\frac{3}{4}\%$	2%
1	0.988 875	0.987 654	0.985 222	0.982 801	0.980 392
2	0.977 874	0.975 461	0.970 662	0.965 898	0.961 169
3	0.966 995	0.963 418	0.956 317	0.949 285	0.942 322
4	0.956 238	0.951 524	0.942 184	0.932 959	0.923 845
5	0.945 600	0.939 777	0.928 260	0.916 913	0.905 731
6	0.935 086	0.929 157	0.911 520	0.895 456	0.885 000
94	0.349 000	0.307 144	0.243 067	0.192 411	0.152 400
95	0.345 493	0.307 236	0.243 067	0.192 411	0.152 400
96	0.341 649	0.303 443	0.239 475	0.189 102	0.149 411
97	0.337 849	0.299 697	0.235 936	0.185 850	0.146 482
98	0.334 090	0.295 997	0.232 449	0.182 653	0.143 609
99	0.330 373	0.292 342	0.229 014	0.179 512	0.140 794
100	0.326 698	0.288 733	0.225 629	0.176 424	0.138 033

n	3%	4%	5%	6%	7%
1	0.970 874	0.961 538	0.952 381	0.943 396	0.934 579
2	0.942 596	0.924 556	0.907 029	0.889 996	0.873 439
3	0.915 142	0.888 996	0.863 838	0.839 619	0.816 298
4	0.888 487	0.854 804	0.822 702	0.792 094	0.762 895
5	0.862 609	0.821 927	0.783 526	0.747 258	0.712 986
6	0.837 484	0.790 315	0.746 215	0.704 961	0.666 342
7	0.813 092	0.759 918	0.710 681	0.665 057	0.629 750
94	0.000 100	0.005 050	0.010 100	0.015 061	0.020 100
95	0.060 320	0.024 090	0.009 705	0.003 944	0.001 616
96	0.058 563	0.023 163	0.009 243	0.003 721	0.001 511
97	0.056 858	0.022 272	0.008 803	0.003 510	0.001 412
98	0.055 202	0.021 416	0.008 384	0.003 312	0.001 319
99	0.053 594	0.020 592	0.007 985	0.003 124	0.001 233
100	0.052 033	0.019 800	0.007 604	0.002 947	0.001 152

## PRESENT VALUE OF \$1 AT COMPOUND INTEREST

## 6.1.2729

Headings are: Periods,  $1\frac{1}{2}\%$ , 2%, 3%, 4%, 6%, 8%; row headings under Periods range from 1 through 20 at intervals of 1, from 20 through 30 at intervals of 5, from 30 through 100 at intervals of 10; entries are tabulated to seven decimal places; 4 pages.

Number of Periods	$1\frac{1}{2}\%$	2%	3%	4%	6%	8%
1	0.9852217	0.9803922	0.9708738	0.9615385	0.9433962	0.9259259
2	0.9706618	0.9611688	0.9425959	0.9245562	0.8899964	0.8573388
3	0.9563170	0.9423223	0.9151417	0.8889964	0.8396193	0.7938322
4	0.9421842	0.9238454	0.8884870	0.8548042	0.7920937	0.7350299
5	0.9282603	0.9057308	0.8626088	0.8219271	0.7472582	0.6805832
20	0.7424704	0.6729713	0.5536758	0.4563870	0.3118047	0.2145482
25	0.6892058	0.6095309	0.4776056	0.3751168	0.2329986	0.1460179
30	0.6397624	0.5520709	0.4119868	0.3083187	0.2313774	0.0993773
90	0.2618522	0.1682614	0.0699278	0.0293089	0.0052780	0.0009814
100	0.2256294	0.1380330	0.0520328	0.0198000	0.0029472	0.0004546

ANNUITY WHICH AMOUNTS TO \$1 AT COMPOUND INTEREST  
(SINKING FUND TABLE)

## 6.1.2729A

Headings are: Periods,  $1\frac{1}{2}\%$ , 2%, 3%, 4%, 6%, 8%; row headings under Periods range from 1 through 20 at intervals of 1, from 20 through 30 at intervals of 5, from 30 through 100 at intervals of 10; entries are tabulated to seven decimal places; 4 pages..

Number of Periods	$1\frac{1}{2}\%$	2%	3%	4%	6%	8%
1	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000	1.0000000
2	0.4962779	0.4950495	0.4926108	0.4901961	0.4854369	0.4807692
3	0.3283830	0.3267547	0.3235304	0.3203485	0.3141098	0.3080335
4	0.2444448	0.2426238	0.2390271	0.2354901	0.2285915	0.2219208
5	0.1940893	0.1921584	0.1883546	0.1846271	0.1773964	0.1704565
20	0.0432457	0.0411567	0.0372157	0.0335818	0.0271846	0.0218522
25	0.0332635	0.0312204	0.0274279	0.0240120	0.0182267	0.0136788
30	0.0266392	0.0246499	0.0210193	0.0178301	0.0126489	0.0088274
90	0.0053211	0.0040460	0.0022556	0.0012078	0.0003184	0.0000786
100	0.0043706	0.0032027	0.0016467	0.0008080	0.0001774	0.0000364

## SUM OF AN ANNUITY OF \$1 FOR N PERIODS

## 6.1.3322

Column headings are: Period, 1%, 2%, 3%, 4%, 5%, 6%, 7%, 8%, 9%, 10%, 12%, 14%, 16%, 18%, 20%, 24%, 28%, 32%, 36%, 40%, 50%, 60%, 70%, 80%; row headings under Period range from 1 through 20, at intervals of 1, followed by 25, 30; entries for the most part are to three decimal places; 14 pages.

Period	1%	2%	3%	4%	5%	6%
1	1.000	1.000	1.000	1.000	1.000	1.000
2	2.010	2.020	2.030	2.040	2.050	2.060
3	3.030	3.060	3.091	3.122	3.152	3.184
4	4.060	4.122	4.184	4.246	4.310	4.375
5	5.101	5.204	5.309	5.416	5.526	5.637

20	22.019	24.297	26.870	29.778	33.066	36.786
25	28.243	32.031	36.459	41.646	47.727	54.865
30	34.785	40.568	47.575	56.085	66.439	79.058

Period	7%	8%	9%	10%	12%	14%
1	1.000	1.000	1.000	1.000	1.000	1.000
2	2.070	2.080	2.090	2.100	2.120	2.140
3	3.215	3.246	3.278	3.310	3.374	3.440
4	4.440	4.506	4.573	4.641	4.770	4.921
5	5.751	5.867	5.985	6.105	6.353	6.610

20	40.995	45.762	51.160	57.275	72.052	91.025
25	63.249	73.106	84.701	98.347	133.334	181.871
30	94.461	113.283	136.308	164.494	241.333	356.787

Period	16%	18%	20%	21%	28%	32%
1	1.000	1.000	1.000	1.000	1.000	1.000
2	2.160	2.180	2.200	2.240	2.280	2.320
3	3.506	3.572	3.640	3.778	3.918	4.062
4	5.066	5.215	5.368	5.684	6.016	6.362
5	6.877	7.154	7.442	8.048	8.700	9.398

20	115.380	146.628	186.688	303.601	494.21	802.86
25	249.214	342.603	471.981	898.092	1706.8	3226.8
30	530.312	790.948	1181.882	2640.916	5873.2	12941.0

Period	36%	40%	50%	60%	70%	80%
1	1.000	1.000	1.000	1.000	1.000	1.000
2	2.360	2.400	2.500	2.600	2.700	2.800
3	4.210	4.360	4.750	5.160	5.590	6.040
4	6.725	7.104	8.125	9.256	10.503	11.872
5	10.146	10.846	13.188	15.810	18.855	22.370

20	1298.8	2089.2	6648.5	20147.0	58059.0	159350.0
25	6053.0	11247.0	50500.0	211270.0	824370.0	3011100.0
30	28172.0	60501.0	383500.0	2215400.0	11705000.0	56896000.0

## AMOUNT OF AN ORDINARY ANNUITY OF 1

## AMOUNT OF AN ORDINARY ANNUITY OF 1

6.1.3540

Column headings are: Period,  $1\frac{1}{2}\%$ ,  $2\frac{1}{2}\%$ ,  $3\frac{1}{2}\%$ ,  $4\frac{1}{2}\%$ ,  $5\frac{1}{2}\%$ ,  $6\frac{1}{2}\%$ ,  $8\%$ ; Periods (row headings) range from 1 through 40 at intervals of 1; entries are tabulated to five decimal places; 9 pages.

6.1.3540

Period	$\frac{(1+i)^n - 1}{i}$						
	$1\frac{1}{2}\%$	$2\frac{1}{2}\%$	$3\frac{1}{2}\%$	$4\%$	$5\%$	$6\%$	$8\%$
1	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
2	2.01500	2.02000	2.02500	2.03000	2.03500	2.04000	2.05000
3	3.04523	3.06040	3.07563	3.09090	3.10623	3.12160	3.15250
4	4.09090	4.12161	4.15252	4.18363	4.21494	4.24646	4.31013
5	5.15227	5.20404	5.25633	5.30914	5.36247	5.41632	5.52563
6	6.22955	6.30812	6.38774	6.46841	6.55015	6.63298	6.80191
7	7.32299	7.43428	7.54743	7.66246	7.77941	7.89829	8.14201
30	37.53868	40.56808	43.90270	47.57542	51.62268	56.08494	66.43885
31	39.10176	42.37944	46.00027	50.00268	54.42947	59.32834	70.76079
32	40.68829	44.22703	48.15028	52.50276	57.33450	62.70147	75.29883
33	42.29861	46.11157	50.35403	55.07784	60.34121	66.20953	80.06377
34	43.93309	48.03380	52.61289	57.73018	63.45315	69.85791	85.06696
35	45.59209	49.99448	54.92821	60.46208	66.67401	73.65222	90.32031
36	47.27597	51.99437	57.30141	63.27594	70.00760	77.59831	95.83632
37	48.98511	54.03425	59.73395	66.17422	73.45787	81.70225	101.62814
38	50.71989	56.11494	62.22730	69.15945	77.02889	85.97034	107.70955
39	52.48068	58.23724	64.78298	72.23423	80.72491	90.40915	114.09502
40	54.26789	60.40198	67.40255	75.40126	84.55028	95.02552	120.79977

## AMOUNT OF AN ANNUITY OF 1 PER ANNUM

## 6.1.36100

Row headings ( $n$ ) range from 1 through 100 at intervals of 1; column headings are:  $5/12\%$ ,  $1/2\%$ ,  $7/12\%$ ,  $3/4\%$ ,  $1\%$ ,  $1-1/8\%$ ,  $1-1/4\%$ ,  $1-1/2\%$ ,  $1-3/4\%$ ,  $2\%$ ,  $3\%$ ,  $4\%$ ,  $5\%$ ,  $6\%$ ,  $7\%$ ; entries are tabulated to six decimal places; 35 pages.

$$\frac{(1+r)^n - 1}{r}$$

$n$	$\frac{5}{12}\%$	$\frac{1}{2}\%$	$\frac{7}{12}\%$	$\frac{3}{4}\%$	$1\%$
1	1.000 000	1.000 000	1.000 000	1.000 000	1.000 000
2	2.004 167	2.005 000	2.005 833	2.007 500	2.010 000
3	3.012 517	3.015 025	3.017 534	3.022 556	3.030 100
4	4.025 070	4.030 100	4.035 136	4.045 225	4.060 401
5	5.041 841	5.050 251	5.058 675	5.075 565	5.101 005
6	6.060 822	6.070 572	6.079 244	6.098 100	6.127 711
95	116.256 112	121.222 430	126.461 131	137.822 495	157.353 755
96	117.740 512	122.828 542	128.198 821	139.856 164	159.927 293
97	119.231 098	124.442 684	129.946 647	141.905 085	162.526 565
98	120.727 894	126.064 898	131.704 670	143.969 373	165.151 831
99	122.230 927	127.695 222	133.472 947	146.049 143	167.803 349
100	123.740 222	129.333 698	135.251 539	148.144 512	170.481 383

$n$	$\frac{1}{8}\%$	$\frac{1}{4}\%$	$\frac{1}{2}\%$	$\frac{3}{4}\%$	$2\%$
1	1.000 000	1.000 000	1.000 000	1.000 000	1.000 000
2	2.011 250	2.012 500	2.015 000	2.017 500	2.020 000
3	3.033 877	3.037 656	3.045 225	3.052 806	3.060 400
4	4.068 008	4.075 627	4.090 903	4.106 230	4.121 608
5	5.113 773	5.126 572	5.152 267	5.178 089	5.204 040
6	6.171 303	6.190 654	6.229 551	6.268 706	6.308 121
94	165.530 223	177.171 587	203.552 850	234.732 369	271.651 921
95	168.392 438	180.386 232	207.606 142	239.840 185	278.084 960
96	171.286 853	183.641 059	211.720 235	245.037 388	284.646 659
97	174.213 830	186.936 573	215.896 038	250.325 542	291.339 592
98	177.173 735	190.273 280	220.134 479	255.706 239	298.166 384
99	180.166 940	193.651 696	224.436 496	261.181 099	305.129 712
100	183.193 818	197.072 342	228.803 043	266.751 768	312.232 306

$n$	$3\%$	$4\%$	$5\%$	$6\%$	$7\%$
1	1.000 000	1.000 000	1.000 000	1.000 000	1.000 000
2	2.030 000	2.040 000	2.050 000	2.060 000	2.070 000
3	3.090 900	3.121 600	3.152 500	3.183 600	3.214 900
4	4.183 627	4.246 464	4.310 125	4.374 616	4.439 943
5	5.309 136	5.416 323	5.525 631	5.637 093	5.750 739
6	6.468 410	6.632 975	6.801 913	6.975 319	7.153 291
95	519.272 026	1012.784 648	2040.693 529	4209.104 250	8823.853 541
96	535.850 186	1054.296 034	2143.728 205	4462.650 505	9442.523 288
97	552.925 692	1097.467 876	2251.914 616	4731.409 535	10104.499 919
98	570.513 463	1142.366 591	2365.510 346	5016.294 107	10812.814 913
99	588.628 867	1189.061 254	2484.785 864	5318.271 753	11570.711 957
100	607.287 733	1237.623 705	2610.025 157	5638.368 059	12381.661 794

## AMOUNT OF ANNUITY OF 1 PER PERIOD

## 6.1.3850

Column headings are: n, 1%, 2%, 3%, 4%, 5%, 6%, 7%, 8%; row headings under n range from 1 through 50 at intervals of 1; entries are tabulated to eight decimal places; 14 pages.

$$s_{\bar{n}|i} = \frac{(1 + i)^n - 1}{i}$$

n	1%	2%	3%	4%	n
1	1.0000 0000	1.0000 0000	1.0000 0000	1.0000 0000	1
2	2.0100 0000	2.0200 0000	2.0300 0000	2.0400 0000	2
3	3.0301 0000	3.0604 0000	3.0909 0000	3.1216 0000	3
4	4.0604 0100	4.1216 0800	4.1836 2700	4.2464 6400	4
5	5.1010 0501	5.2040 4016	5.3091 3581	5.4163 2256	5

46	58.0458 8547	74.3305 6447	96.5014 5723	126.8705 6772	46
47	59.6263 4432	76.8171 7576	100.3965 0095	132.9453 9043	47
48	61.2226 0777	79.3535 1927	104.4083 9598	139.2632 0604	48
49	62.8348 3385	81.9405 8966	108.5406 4785	145.8337 3429	49
50	64.4631 8218	84.5794 0145	112.7968 6729	152.6670 8366	50

n	5%	6%	7%	8%	n
1	1.0000 0000	1.0000 0000	1.0000 0000	1.0000 0000	1
2	2.0500 0000	2.0600 0000	2.0700 0000	2.0800 0000	2
3	3.1525 0000	3.1836 0000	3.2149 0000	3.2464 0000	3
4	4.3101 2500	4.3746 1600	4.4399 4300	4.5061 1200	4
5	5.5256 3125	5.6370 9296	5.7507 3901	5.8666 0096	5

46	168.6851 6366	226.5081 2462	306.7517 6260	418.4260 6677	46
47	178.1194 2185	241.0986 1210	329.2243 8598	452.9001 5211	47
48	188.0253 9294	256.5645 2882	353.2700 9300	490.1321 6428	48
49	198.4266 6259	272.9584 0055	378.9989 9951	530.3427 3742	49
50	209.3479 9572	290.3359 0458	406.5289 2947	573.7701 5642	50

## PRESENT VALUE OF ANNUITY OF \$1

## 6.1.4322

Column headings are: Period, 1%, 2%, 3%, 4%, 5%, 6%, 7%, 8%, 9%, 10%, 12%, 14%, 16%, 18%, 20%, 24%, 28%, 32%, 36%; row headings under Period range from 1 through 20 at intervals of 1, followed by 25, 30; entries are tabulated to three decimal places; 10 pages.

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
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1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487
4	3.902	3.808	3.717	3.630	3.548	3.465	3.387	3.312	3.240	3.170
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791

16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.312	7.824
17	15.562	14.292	13.168	12.166	11.274	10.477	9.763	9.122	8.544	8.022
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201
19	17.226	15.678	14.324	13.134	12.085	11.158	10.338	9.604	8.958	8.385
20	18.046	16.351	14.877	13.590	12.462	11.470	10.594	9.818	9.128	8.514
25	22.023	19.523	17.413	15.622	14.094	12.783	11.654	10.675	9.823	9.077
30	25.808	22.397	19.600	17.292	15.373	13.765	12.409	11.258	10.274	9.427

Period	12%	14%	16%	18%	20%	21%	28%	32%	36%
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1	0.893	0.877	0.862	0.847	0.833	0.808	0.781	0.758	0.735
2	1.690	1.647	1.605	1.566	1.528	1.457	1.392	1.332	1.276
3	2.402	2.322	2.248	2.174	2.106	1.981	1.868	1.766	1.674
4	3.037	2.914	2.798	2.690	2.589	2.404	2.241	2.098	1.966
5	3.605	3.433	3.274	3.127	2.991	2.745	2.532	2.345	2.181

16	6.974	6.265	5.669	5.162	4.730	4.033	3.503	3.088	2.758
17	7.120	5.373	5.749	4.222	4.775	4.059	3.518	3.097	2.763
18	7.250	6.467	5.818	5.273	4.812	4.080	3.529	3.104	2.767
19	7.366	6.550	5.877	5.316	4.844	4.097	3.539	3.109	2.770
20	7.469	6.623	5.929	5.353	4.870	4.110	3.546	3.113	2.772
25	7.843	6.873	6.097	5.467	4.948	4.147	3.564	3.122	2.776
30	8.055	7.003	6.177	5.517	4.979	4.160	3.569	3.124	2.778

PRESENT VALUE OF \$1 RECEIVED ANNUALLY FOR N YEARS

6.1.4350

Column headings are: Years (N), 1%, 2%, 4%, 6%, 8%, 10%, 12%, 14%, 15%, 16%, 18%, 20%, 22%, 24%, 25%, 26%, 28%, 30%, 35%, 40%, 45%, 50%; row headings (N) range from 1 through 30 at intervals of 1, followed by 40, 50; entries are to three decimal places; 8 pages.

Years (N)	1%	2%	4%	6%	8%	10%	12%	14%	15%	16%	18%	20%	22%	24%	25%	26%	28%	30%	35%	40%	45%	50%
1.....	0.990	0.980	0.962	0.943	0.916	0.893	0.877	0.870	0.862	0.847	0.833	0.820	0.806	0.800	0.794	0.781	0.769	0.741	0.714	0.690	0.667	
2.....	0.970	0.942	0.886	0.833	0.783	0.736	0.690	0.647	0.626	0.605	0.586	0.566	0.548	0.528	0.517	0.492	0.460	0.434	0.402	0.361	0.324	
3.....	0.941	0.884	0.773	0.673	0.577	0.487	0.402	0.322	0.283	0.246	0.214	0.187	0.166	0.146	0.126	0.106	0.092	0.081	0.072	0.061	0.051	
4.....	0.902	0.808	0.610	0.465	0.312	0.170	0.037	2.914	2.855	2.798	2.690	2.589	2.494	2.404	2.316	2.241	2.166	1.997	1.889	1.720	1.605	
5.....	0.853	0.713	0.452	0.212	0.993	3.791	3.605	3.433	3.352	3.274	3.127	2.991	2.864	2.745	2.689	2.635	2.532	2.416	2.220	2.035	1.876	1.737
10.....	25.808	22.396	17.292	13.763	11.258	9.427	6.035	3.003	6.356	6.177	5.517	4.979	4.534	4.160	3.995	3.842	3.569	3.332	2.857	2.500	2.222	2.000
20.....	32.835	27.355	19.793	15.046	11.935	9.779	6.244	3.105	6.642	6.234	5.548	4.997	4.544	4.166	3.999	3.846	3.571	3.333	2.857	2.500	2.222	2.000
30.....	39.196	31.424	21.482	15.762	12.234	9.915	6.304	3.133	6.661	6.246	5.554	4.999	4.545	4.167	4.000	3.846	3.571	3.333	2.857	2.500	2.222	2.000

PRESENT VALUE OF AN ORDINARY ANNUITY OF 1

6.1.4540

Column headings are: Period,  $1\frac{1}{2}\%$ , 2%,  $2\frac{1}{2}\%$ ,  $3\frac{1}{2}\%$ ,  $4\frac{1}{2}\%$ ,  $5\frac{1}{2}\%$ , 6%, 8%; row headings under Period range from 1 through 40 at intervals of 1; entries are to five decimals; 10 pages.

Period	1 1/2%	2%	2 1/2%	3%	1	3 1/2%	4%	5%	6%	8%
1	.98522	.98039	.97561	.97087	.96618	.96154	.95238	.94340	.92593	
2	1.95588	1.94156	1.92742	1.91347	1.89969	1.88609	1.85941	1.83339	1.78326	
3	2.91220	2.88388	2.85602	2.82861	2.80164	2.77509	2.72325	2.67301	2.57710	
4	3.85438	3.80773	3.76197	3.71710	3.67308	3.62990	3.54595	3.46511	3.31213	
5	4.78264	4.71346	4.64583	4.57971	4.51605	4.45182	4.32948	4.21236	3.99271	
38	28.80505	26.44064	24.34860	22.49246	20.84109	19.36786	16.86789	14.84602	11.82887	
39	29.36458	26.90259	24.73034	22.80822	21.10250	19.59448	-17.01704	-14.94907	-11.87858	
40	29.91585	27.35548	25.10278	23.11477	21.35507	19.79277	17.15909	15.04630	11.92461	

## PRESENT VALUE OF 1 PER ANNUM

## 6.1.46100

Column headings are: n;  $5/12\%$ ,  $1/2\%$ ,  $7/12\%$ ,  $3/4\%$ ,  $1\%$ ,  $1-1/8\%$ ,  $1-1/4\%$ ,  $1-1/2\%$ ,  $1-3/4\%$ ,  $2\%$ ,  $3\%$ ,  $4\%$ ,  $5\%$ ,  $6\%$ ,  $7\%$ ; row headings under n range from 1 through 100; entries are tabulated to six decimal places; 35 pages..

$$\frac{1 - (1 + r)^{-n}}{r}$$

n	$\frac{5}{12}\%$	$\frac{1}{2}\%$	$\frac{7}{12}\%$	$\frac{3}{4}\%$	1%
1	0.995 851	0.995 025	0.994 200	0.992 556	0.990 099
2	1.987 569	1.985 099	1.982 635	1.977 723	1.970 395
3	2.975 173	2.970 248	2.965 337	2.955 556	2.940 985
4	3.958 678	3.950 496	3.942 340	3.926 110	3.901 966
5	4.938 103	4.925 866	4.913 677	4.889 440	4.853 431
6	5.917 433	5.896 794	5.879 389	5.845 509	5.805 7
95	78.318 563	75.475 694	72.775 430	67.770 377	61.142 980
96	78.989 441	76.095 218	73.347 569	68.258 439	61.527 703
97	79.657 534	76.711 660	73.916 390	68.742 867	61.908 617
98	80.322 856	77.325 035	74.481 912	69.223 689	62.285 759
99	80.985 416	77.935 358	75.044 154	69.700 932	62.659 168
100	81.645 228	78.542 645	75.603 136	70.174 623	63.028 879

n	$\frac{1}{8}\%$	$\frac{1}{4}\%$	$\frac{1}{2}\%$	$\frac{3}{4}\%$	2%
1	0.988 875	0.987 654	0.985 222	0.982 801	0.980 392
2	1.966 749	1.963 115	1.955 883	1.948 699	1.941 561
3	2.933 745	2.926 534	2.912 200	2.897 984	2.883 883
4	3.889 982	3.878 058	3.854 385	3.830 943	3.807 729
5	4.835 582	4.817 835	4.782 645	4.747 855	4.713 460
6	5.77 55	5.746 918	5.60 127	5.68 299	5.301 421
95	58.520 052	55.724 570	50.701 675	46.337 035	42.529 434
96	58.857 901	56.024 267	50.937 611	46.522 884	42.675 916
97	59.191 991	56.320 264	51.170 060	46.705 537	42.819 525
98	59.522 364	56.612 606	51.399 074	46.885 049	42.960 319
99	59.849 063	56.901 339	51.624 704	47.061 473	43.098 352
100					

n	3%	4%	5%	6%	7%
1	0.970 874	0.961 538	0.952 381	0.943 396	0.934 579
2	1.913 470	1.886 095	1.859 410	1.833 393	1.808 018
3	2.828 611	2.775 091	2.723 248	2.673 012	2.624 316
4	3.717 098	3.629 895	3.545 951	3.465 106	3.387 211
5	4.579 707	4.451 822	4.329 477	4.212 364	4.100 197
6	5.47 91	5.24 17	5.07 69	4.87 22	4.76 57
95	31.381 219	24.420 919	19.815 134	16.604 653	14.264 134
96	31.438 077	24.443 191	19.823 937	16.608 163	14.265 546
97	31.493 279	24.464 607	19.832 321	16.611 475	14.266 865
98	31.546 872	24.485 199	19.840 306	16.614 599	14.268 098
99	31.598 905	24.504 999	19.847 910	16.617 546	14.269 251
100					

## PRESENT VALUE OF ANNUITY OF \$1 AT COMPOUND INTEREST

6.1.4729

Headings are: Periods,  $1\frac{1}{2}\%$ , 2%, 3%, 4%, 6%, 8%; row headings under Periods range from 1 through 20 at intervals of 1, from 20 through 30 at intervals of 5, from 30 through 100 at intervals of 10; entries are tabulated to seven decimal places; 4 pages.

Number of Periods	$1\frac{1}{2}\%$	2%	3%	4%	6%	8%
1	0.9852217	0.9803922	0.9708738	0.9615385	0.9433962	0.9259259
2	1.9558834	1.9415609	1.9134697	1.8860947	1.8333927	1.7832648
3	2.9122004	2.8838833	2.8286114	2.7750910	2.6730120	2.5770970
4	3.8543847	3.8077287	3.7170984	3.6298952	3.4651056	3.3121268
5	4.7826450	4.7134595	4.5797072	4.4518223	4.2123638	3.9927100
20	17.1686388	16.3514333	14.8774749	13.5903263	11.4699212	9.8181474
25	20.7196112	19.5234565	17.4131477	15.6220799	12.7833562	10.6747762
30	24.0158380	22.3964556	19.6004414	17.2920333	13.7648312	11.2577833
40	29.9158452	27.3554792	23.1147720	19.7927739	15.0462969	11.9246133
50	34.9996881	31.4236059	25.7297640	21.4821846	15.7618606	12.2334846
60	39.3802689	34.7608867	27.6755637	22.6234900	16.1614277	12.3765518
70	43.1548718	37.4936193	29.1234214	23.3945150	16.2845439	12.4428196
80	46.4073235	39.7445136	30.2007634	23.9153918	16.5091308	12.4735144
90	49.2098545	41.5869292	31.0024071	24.2672776	16.5786994	12.4877321
100	51.6247037	43.0983516	31.5989053	24.5049990	16.6175462	12.4943176

## PRESENT VALUE OF ANNUITY OF 1 PER PERIOD

6.1.4850

Column headings are:  $n$ , 1%, 3%, 3-1/2%, 4%, 5%, 6%, 7%, 8%; row headings under  $n$  range from 1 through 50 at intervals of 1; entries are tabulated to eight decimal places; 14 pages.

$$a_{\bar{n}|i} = \frac{1 - (1 + i)^{-n}}{i}$$

$n$	1%	3%	3½%	4%
1	0.9900 9901	0.9708 7379	0.9661 8357	0.9615 3846
2	1.9703 9506	1.9134 6970	1.8996 9428	1.8860 9467
3	2.9409 8521	2.8286 1135	2.8016 3698	2.7750 9103
4	3.9019 6555	3.7170 9840	3.6730 7921	3.6298 9522
5	4.8534 3124	4.5797 0719	4.5150 5238	4.4518 2233

46	36.7272 3608	24.7754 4907	22.7009 1813	20.8846 5356
47	37.3536 9909	25.0247 0783	22.8994 3780	21.0429 3612
48	37.9739 5949	25.2667 0664	23.0912 4425	21.1951 3088
49	38.5880 7871	25.5016 5693	23.2765 6450	21.3414 7200
50	39.1961 1753	25.7297 6401	23.4556 1787	21.4821 8462

$n$	5%	6%	7%	8%
1	0.9523 8095	0.9433 9623	0.9345 7944	0.9259 2593
2	1.8594 1043	1.8333 9267	1.8080 1817	1.7832 6475
3	2.7232 4803	2.6730 1195	2.6243 1604	2.5770 9699
4	3.5459 5050	3.4651 0561	3.3872 1126	3.3121 2684
5	4.3294 7667	4.2123 6379	4.1001 9744	3.9927 1004

46	17.8800 6650	15.5243 6990	13.6500 2018	12.1374 0880
47	17.9810 1571	15.5890 2821	13.6916 0764	12.1642 6741
48	18.0771 5782	15.6500 2661	13.7304 7443	12.1891 3649
49	18.1687 2173	15.7075 7227	13.7667 9853	12.2121 6341
50	18.2559 2546	15.7618 6064	13.8007 4629	12.2334 8464

## AMERICAN EXPERIENCE TABLE OF MORTALITY

## 6.2.1

Columns are headed: Age, Number Living, Number Dying, Yearly probability of Dying, Yearly Probability of Living; ages range from 10 through 95 years at intervals of 1 year; entries in the Number Living and Number Dying columns are integers; entries in the two Probability columns are tabulated to six decimal places; 6 pages.

Age	Number Living	Yearly Probability of Dying		Yearly Probability of Living		Age	Number Living	Yearly Probability of Dying		Yearly Probability of Living	
		Number Dying	Probability of Dying	Number Dying	Probability of Living			Number Dying	Probability of Dying	Number Dying	Probability of Living
10	100 000	749	0.007 490	0.992 510		53	66 797	1 091	0.016 333	0.983 667	
11	99 251	746	0.007 516	0.992 484		54	65 706	1 143	0.017 396	0.982 604	
12	98 505	743	0.007 543	0.992 457		55	64 563	1 199	0.018 571	0.981 429	
13	97 762	740	0.007 569	0.992 431		56	63 364	1 260	0.019 885	0.980 115	
14	97 022	737	0.007 596	0.992 404		57	62 104	1 325	0.021 335	0.978 665	
15	96 285	735	0.007 634	0.992 366		58	60 779	1 394	0.022 936	0.977 064	
16	95 550	732	0.007 661	0.992 339		59	59 385	1 468	0.024 720	0.975 280	
17	94 818	729	0.007 688	0.992 312		60	57 917	1 546	0.026 693	0.973 307	
18	94 089	727	0.007 727	0.992 273		61	56 371	1 628	0.028 880	0.971 120	
19	93 362	725	0.007 765	0.992 235		62	54 743	1 713	0.031 292	0.968 708	
20	92 637	723	0.007 805	0.992 195		63	53 030	1 800	0.033 943	0.966 057	
21	91 914	722	0.007 855	0.992 145		64	51 230	1 889	0.036 873	0.963 127	
22	91 192	721	0.007 906	0.992 094		65	49 341	1 980	0.040 129	0.959 871	
23	90 471	720	0.007 958	0.992 042		66	47 361	2 070	0.043 707	0.956 293	
24	89 751	719	0.008 011	0.991 989		67	45 291	2 158	0.047 647	0.952 353	
30	85 441	720	0.008 427	0.991 573		73	31 243	2 505	0.080 178	0.919 522	
31	84 721	721	0.008 510	0.991 490		74	28 738	2 501	0.087 028	0.912 972	
32	84 000	723	0.008 607	0.991 393		75	26 237	2 476	0.094 371	0.905 629	
33	83 277	726	0.008 718	0.991 282		76	23 761	2 431	0.102 311	0.897 689	
34	82 551	729	0.008 831	0.991 169		77	21 330	2 369	0.111 064	0.888 936	
35	81 822	732	0.008 946	0.991 054		78	18 961	2 291	0.120 827	0.879 173	
36	81 090	737	0.009 089	0.990 911		79	16 670	2 196	0.131 734	0.868 266	
37	80 353	742	0.009 234	0.990 766		80	14 474	2 091	0.144 466	0.855 534	
38	79 611	749	0.009 408	0.990 592		81	12 383	1 964	0.158 605	0.841 395	
39	78 862	756	0.009 586	0.990 414		82	10 419	1 816	0.174 297	0.826 703	
40	78 106	765	0.009 794	0.990 206		83	8 603	1 648	0.191 561	0.808 439	
41	77 341	774	0.010 008	0.989 992		84	6 955	1 470	0.211 359	0.788 641	
42	76 567	785	0.010 252	0.989 748		85	5 485	1 292	0.235 552	0.764 448	
43	75 782	797	0.010 517	0.989 483		86	4 193	1 114	0.265 681	0.734 319	
44	74 985	812	0.010 829	0.989 171		87	2 079	933	0.303 020	0.696 980	
45	74 173	828	0.011 163	0.988 837		88	2 146	744	0.346 692	0.653 308	
46	73 345	848	0.011 662	0.988 438		89	1 402	555	0.395 863	0.604 137	
47	72 497	870	0.012 000	0.988 000		90	847	385	0.454 645	0.545 455	
48	71 627	896	0.012 509	0.987 491		91	462	246	0.532 468	0.467 532	
49	70 781	927	0.013 106	0.986 894		92	216	137	0.634 259	0.365 741	
50	69 804	962	0.013 781	0.986 219		93	79	58	0.734 177	0.265 823	
51	68 842	1 001	0.014 641	0.985 459		94	21	18	0.857 143	0.142 857	
52	67 841	1 044	0.015 389	0.984 611		95	8	3	1.000 000	0.000 000	

## 100. MISCELLANEOUS

### MISCELLANEOUS

#### TABLES OF MEASURE

##### 100.1.1

This table includes linear measure and square measure in both the United States System and the Metric System; also a short table of equivalents featuring linear measure only; 3 pages.

### 1. LINEAR MEASURE

#### United States System

1 foot (ft.)	= 12 inches
1 yard (yd.)	= 3 ft.
1 rod (rd.)	= $5\frac{1}{2}$ yd. = $16\frac{1}{2}$ ft.
1 mile (mi.)	= 320 rd. = 1760 yd. = 5280 ft.

#### Metric System

1 centimeter (cm.)	= 10 millimeters
1 meter (m.)	= 100 cm. = 1000 mm.
1 kilometer (km.)	= 1000 m.

### 2. SQUARE MEASURE

#### United States System

1 square foot (sq. ft.)	= 144 square inches
1 square yard (sq. yd.)	= 9 sq. ft.
1 square rod (sq. rd.)	= $30\frac{1}{4}$ sq. yd.
1 Acre (A.)	= 160 sq. rd.

#### Metric System

1 square centimeter (cm. <sup>2</sup> )	= 100 mm. <sup>2</sup>
1 square meter (m. <sup>2</sup> )	= 10,000 cm. <sup>2</sup>
1 square kilometer (km. <sup>2</sup> )	= 1,000,000 m. <sup>2</sup>

### 3. EQUIVALENTS

1 in. = 2.54 cm.	1 cm. = 0.3937 in.
1 ft. = 30.48 cm.	1 m. = 39.37 in.
1 mi. = 1.61 km.	1 km. = 0.62 mi

## TABLE OF MEASURES

## 100.1.2

Units of Length, Weight, Capacity, Area, Volume - in U.S. and Metric Systems, each with equivalents within the same system; a very brief list of conversions covering a few units in length, weight, and capacity, from one system to the other; 4 pages.

<b>Measures of Length</b>	12 inches (in.)	= 1 foot (ft.)
	36 inches	= 1 yard (yd.)
	3 feet	= 1 yard
	16 $\frac{1}{2}$ feet	= 1 rod (rd.)
<b>Metric Measures of Length</b>	1000 millimeters (mm)	= 1 meter (m)
	100 centimeters (cm)	= 1 meter
	10 decimeters (dm)	= 1 meter
	10 meters	= 1 decameter (dkm)
	100 meters	= 1 hectometer (hm)
	1000 meters	= 1 kilometer (km)
<b>Measures of Weight</b>	16 ounces (oz.)	= 1 pound (lb.)
	2000 pounds	= 1 ton (T.)
<b>Metric Measures of Weight</b>	1000 grams (g)	= 1 kilogram (kg)
	1000 milligrams (mg)	= 1 gram
<b>Metric Measures of Capacity</b>	1000 liters (l)	= 1 kiloliter (kl)
	100 centiliters (cl)	= 1 liter
	1000 milliliters (ml)	= 1 liter
<b>Liquid Measures</b>	8 ounces	= 1 cup (c.)
	2 cups	= 1 pint (pt.)
	2 pints	= 1 quart (qt.)
	4 quarts	= 1 gallon (gal.)
<b>Equivalent Units</b>	2.54 centimeters	= 1 inch
	.9144 meter	= 1 yard
	28.35 grams	$\approx$ 1 ounce
	.4536 kilogram	$\approx$ 1 pound
	.9464 liter	$\approx$ 1 quart
<b>Measures of Area</b>	144 square inches (sq. in.)	= 1 square foot (sq. ft.)
	9 square feet	= 1 square yard (sq. yd.)
<b>Measures of Volume</b>	1728 cubic inches (cu. in.)	= 1 cubic foot (cu. ft.)
	27 cubic feet	= 1 cubic yard (cu. yd.)

## WEIGHTS AND MEASURES

## 100.1.3

A series of brief tables covering the English units of measure; Apothecaries' Weight, Avoirdupois Weight, Circular Measure, Cubic Measure, Dry Measure, Liquid Measure, Long Measure, Troy Weight; 4 pages.

## ENGLISH

## APOTHECARIES' WEIGHT

20 grains = 1 scruple	3 scruples = 1 dram
8 drams = 1 ounce	12 ounces = 1 pound
The ounce and pound in this are the same as in Troy Weight.	

## AVOIRDUPOIS WEIGHT

$27\frac{1}{2}$ grains = 1 dram	16 drams = 1 ounce
16 ounces = 1 pound	100 pounds = 1 cwt.
2000 pounds = 1 short ton	2240 pounds = 1 long ton
1 oz. Troy = 480 gr.	1 cwt. Avoirdupois = $437\frac{1}{2}$ grains
1 lb. Troy = 5760 grains	1 lb. Avoirdupois = 7000 grains

## CIRCULAR MEASURE

60 seconds = 1 minute	60 minutes = 1 degree
30 degrees = 1 sign	90 degrees = 1 quadrant
4 quadrants = 12 signs, or 360 degrees = circle	

## CUBIC MEASURE

2 pints = 1 quart

8 quarts = 1 peck

4 pecks = 1 bushel

## DRY MEASURE

4 gills = 1 pint

3 $\frac{1}{2}$  gallons = 1 barrel

2 pints = 1 quart

4 quarts = 1 gallon

2 barrels = 1 hogshead

## LIQUID MEASURE

12 inches = 1 foot

3 feet = 1 yard

8 $\frac{1}{2}$  yards = 1 rod

40 rods = 1 furlong

8 furlongs = 1 stat. mile

3 miles = 1 league

## TROY WEIGHT

24 grains = 1 pwt.

20 pwt. = 1 ounce

12 ounces = 1 pound

Used for weighing gold, silver, and jewels.

## EQUIVALENTS

## 100.1.4

**Length, Volume, and Mass - English Units of Measure - and their Metric equivalents; 2 pages.**

**LENGTH**

$$\begin{aligned}1 \text{ in.} &= 2.54 \text{ cm} \\1 \text{ ft} &= 0.3048 \text{ m} \\1 \text{ mi} &= 1.609 \text{ km} \\1 \text{ Angstrom } (\text{\AA}) &= 1 \times 10^{-8} \text{ cm}\end{aligned}$$

$$\begin{aligned}1 \text{ cm} &= 0.3937 \text{ in.} \\1 \text{ m} &= 39.37 \text{ in.} = 3.2808 \text{ ft} \\1 \text{ km} &= 39,370 \text{ in.} = \\3,280 \text{ ft} &= 0.62137 \text{ mi}\end{aligned}$$

$$1 \text{ mi}^2 = 2.59 \text{ km}^2$$

$$1 \text{ km}^2 = 0.3861 \text{ mi}^2$$

**VOLUME**

$$\begin{aligned}1 \text{ in.}^3 &= 16.387 \text{ cm}^3 \\1 \text{ ft}^3 &= 0.02832 \text{ m}^3 \\1 \text{ mi}^3 &= 4.1681 \text{ km}^3 \\1 \text{ qt} &= 0.946 \text{ l}\end{aligned}$$

$$\begin{aligned}1 \text{ cm}^3 &= 0.0610 \text{ in.}^3 \\1 \text{ m}^3 &= 35.315 \text{ ft}^3 \\1 \text{ km}^3 &= 0.2399 \text{ mi}^3 \\1 \text{ l} &= 1.06 \text{ qt}\end{aligned}$$

**MASS**

$$\begin{aligned}1 \text{ lb} &= 453.6 \text{ g} \\1 \text{ oz} &= 28.35 \text{ g} \\1 \text{ ft}^3 \text{ of water} &= 62.4 \text{ lb} \\1 \text{ atomic mass unit} &\\(a.m.u.) &= 1.66 \times 10^{-24} \text{ g}\end{aligned}$$

$$\begin{aligned}1 \text{ g} &= 0.0022 \text{ lb} = 0.0353 \text{ oz} \\1 \text{ kg} &= 2.2 \text{ lb} = 35.3 \text{ oz} \\1 \text{ cm}^3 \text{ of water} &= 1 \text{ g}\end{aligned}$$

## CONVERSION FACTORS (U.S. AND METRIC UNITS)

## 100.1.5

Each frequently used unit, U.S. and Metric is listed alphabetically and its equivalent in other units is listed; not every possible equivalent is given, but the table is a good tool; 5 pages.

Each unit in bold face type is followed by its equivalent in other units of the same quantity.

**Acre**—0.0015625 square mile (statute);  $4.3560 \times 10^4$  square feet; 0.40468564 hectare.  
**Bushel**—(U.S.)—1.244456 cubic feet; 2150.42 cubic inches; 0.035239 cubic meter; 35.23808 liters.  
**Centimeter**—0.0328084 foot; 0.393701 inch.  
**Circular Mil**— $7.853982 \times 10^{-7}$  square inches;  $5.067075 \times 10^{-8}$  square centimeters.  
**Cubic Centimeter**—0.061024 cubic inch; 0.270512 dram (U. S. fluid); 16.230664 minims (U. S.); 0.999972 milliliter.

**Liter**—0.264179 gallon (U. S. liquid); 0.0353157 cubic foot; 1.056718 quarts (U. S. liquid).  
**Meter**—1.093613 yards; 3.280840 feet; 39.37008 inches.  
**Mile (statute)**—1.609344 kilometers.  
**Ounce (U. S. fluid)**—1.804688 cubic inches; 29.573730 cubic centimeters.  
**Ounce (avoirdupois)**—28.349523 grams.  
**Ounce (apothecary or troy)**—31.103486 grams.  
**Pint (U. S. liquid)**—0.473163 liter; 473.17647 cubic centimeters.

**Cubic Meter**—35.314667 cubic feet; 264.17205 gallons (U. S. liquid).  
**Foot**—0.3048 meter.  
**Gallon (U. S. liquid)**—0.1336816 cubic foot; 0.832675 gallon (British); 231 cubic inches; 0.0037854 cubic meter; 3.785306 liters.  
**Grain**—0.06479891 grain.  
**Gram**—0.00220462 pound (avoirdupois); 0.035274 ounce (avoirdupois); 15.432358 grains.  
**Hectare**—2.471054 acres;  $1.07639 \times 10^4$  square feet.  
**Inch**—2.54 centimeters.  
**Kilogram**—2.204623 pounds (avoirdupois).  
**Kilometer**—0.621371 mile (statute).

**Pound (apothecary or troy)**—0.3732417 kilogram; 373.24172 grams.  
**Quart (U. S. dry)**—1.10119 liters.  
**Quart (liquid)**—0.946326 liter.  
**Radian**—57.295779 degrees.  
**Rod**—5.0292 meters.  
**Square Centimeter**—0.155000 square inch.  
**Square Foot**—0.09290304 square meter.  
**Square Inch**—645.16 square millimeters.  
**Square Meter**—10.763910 square feet.  
**Square Yard**—0.836127 square meter.  
**Ton (short)**—907.18474 kilograms.  
**Yard**—0.9144 meter.

## CONVERSION TABLE

### 100.1.

A table implementing the conversion of units of Length, Area, Mass, Liquid Volume from one system to the other, U. S. and Metric, by multiplication; also includes method of converting degrees Fahrenheit to Celsius, and the reverse; 5 pages.

	<b>When you know</b>	<b>You can find</b>	<b>If you multiply by</b>
<b>Length</b>	inches	millimeters	25
	feet	centimeters	30
	yards	meters	0.9
	miles	kilometers	1.6
	millimeters	inches	0.04
	centimeters	inches	0.4
	meters	yards	1.1
	kilometers	miles	0.6
<b>Area</b>	square inches	square centimeters	6.5
	square feet	square meters	0.09
	square yards	square meters	0.8
	square miles	square kilometers	2.6
	acres	square hectometers (hectares)	0.4
	square centimeters	square inches	0.16
	square meters	square yards	1.2
	square kilometers	square miles	0.4
<b>Mass</b>	square hectometers (hectares)	acres	2.5
	ounces	grams	28
	pounds	kilograms	0.45
	short tons	megagrams (metric tons)	0.9
	grams	ounces	0.035
	kilograms	pounds	2.2
<b>Liquid Volume</b>	megagrams (metric tons)	short tons	1.1
	ounces	milliliters	30
	pints	liters	0.47
	quarts	liters	0.95
	gallons	liters	3.8
	milliliters	ounces	0.034
	liters	pints	2.1
	liters	quarts	1.06
<b>Temper-</b> <b>ature</b>	liters	gallons	0.26
	degrees Fahrenheit	degrees Celsius	0.556 (after subtracting 32)
	degrees Celsius	degrees Fahrenheit	1.8 (then add 32)

Source: U.S. Department of Commerce, National Bureau of Standards. *A Metric America*. Special Publication 345, Washington, D.C.: Government Printing Office, July 1971. P. 32.

## METRIC CONVERSION TABLE

## 100.1.7

In this table, two related sets of conversions are listed side by side, as two columns, affording easier comparison. For examples, Inches to Centimeters, then Centimeters to Inches; Feet to Meters, Meters to Feet. Beneath the specific unit being converted in each column, whether U.S. or Metric, 1 through 9 of the units are listed and the corresponding nine values in converted form are given. The first column covers the conversion of U.S. or British units to Metric units, the second column does the reverse. Twenty-two double conversions are tabulated, each succeeding set becoming more complex; the last three cover British Thermal Units to Kilojoules, and reverse; Horsepower to Kilowatts and reverse; Pounds-Force to Newtons and reverse; 15 pages.

Inches	Centimeters	Centimeters	Inches
1	2.54	1	0.393701
2	5.08	2	0.787402
3	7.62	3	1.181103
4	10.16	4	1.574804
5	12.70	5	1.968505
6	15.24	6	2.362206
7	17.78	7	2.755907
8	20.32	8	3.149608
9	22.86	9	3.543309

Ounces Avoirdupois	Grams	Grams	Ounces Avoirdupois
1	28.350	1	0.035274
2	56.699	2	0.070548
3	85.049	3	0.10582
4	113.401	4	0.14111
5	141.75	5	0.17637
6	170.10	6	0.21164
7	198.45	7	0.24692
8	226.80	8	0.28219
9	255.15	9	0.31747

Foot	Meters	Meters	Foot
1	0.3048	1	3.280940
2	0.6096	2	6.561880
3	0.9144	3	9.842520
4	1.2192	4	13.123360
5	1.5240	5	16.404200
6	1.8288	6	19.685040
7	2.1336	7	22.965880
8	2.4384	8	26.246720
9	2.7432	9	29.527560

Pounds per Foot	Kilograms per Meter	Kilograms per Meter	Pounds per Foot
1	1.4882	1	0.6720
2	2.9763	2	1.3439
3	4.4645	3	2.0159
4	5.9527	4	2.6879
5	7.4418	5	3.3598
6	8.9290	6	4.0318
7	10.4171	7	4.7038
8	11.9053	8	5.3758
9	13.3935	9	6.0477

Yards	Meters	Meters	Yards
1	0.9144	1	1.0936133
2	1.8288	2	2.187266
3	2.7432	3	3.2808399
4	3.6576	4	4.3744532
5	4.5720	5	5.4680665
6	5.4864	6	6.5616798
7	6.4008	7	7.6552931
8	7.3152	8	8.7489064
9	8.2296	9	9.8425197

Pounds per Square Inch	Kilograms per Square Centimeter	Kilograms per Square Centimeter	Pounds per Square Inch
1	0.0703	1	14.22
2	0.1406	2	28.45
3	0.2109	3	42.67
4	0.2812	4	56.89
5	0.3515	5	71.12
6	0.4218	6	85.34
7	0.4922	7	99.56
8	0.5625	8	113.79
9	0.6328	9	128.01

Cubic Inches	Cubic Centimeters	Cubic Centimeters	Cubic Inches
1	16.39	1	0.0610
2	32.77	2	0.1221
3	49.16	3	0.1831
4	65.55	4	0.2441
5	81.94	5	0.3051
6	98.32	6	0.3661
7	114.71	7	0.4272
8	131.10	8	0.4882
9	147.48	9	0.5492

British Thermal Units	Kilojoules	Kilojoules	British Thermal Units
1	105.51	1	94.78
2	211.01	2	189.56
3	316.52	3	284.35
4	422.02	4	379.13
5	527.53	5	473.91
6	633.03	6	568.69
7	738.54	7	663.47
8	844.04	8	758.25
9	949.55	9	853.04

Cubic Feet	Cubic Meters	Cubic Meters	Cubic Feet
1	0.0283	1	35.3
2	0.0566	2	70.6
3	0.0850	3	105.9
4	0.1133	4	141.3
5	0.1416	5	176.6
6	0.1699	6	211.9
7	0.1982	7	247.2
8	0.2265	8	282.5
9	0.2549	9	317.8

Horsepower	Kilowatts	Kilowatts	Horsepower
1	0.746	1	1.341
2	1.491	2	2.682
3	2.237	3	4.023
4	2.983	4	5.364
5	3.729	5	6.705
6	4.474	6	8.046
7	5.220	7	9.387
8	5.966	8	10.728
9	6.711	9	12.069

Cubic Feet	Liters	Liters	Cubic Feet
1	28.32	1	0.0353
2	56.63	2	0.0706
3	84.95	3	0.1060
4	113.26	4	0.1413
5	141.58	5	0.1766
6	169.90	6	0.2119
7	198.21	7	0.2472

Pounds-Force	Newtons	Newtons	Pounds-Force
1	4.448	1	0.22481
2	8.896	2	0.44962
3	13.345	3	0.67443
4	17.793	4	0.89924
5	22.241	5	1.12404
6	26.689	6	1.34885
7	31.138	7	1.57366

## MISCELLANEOUS

## 100.1.8

This is a short table which gives thirteen very basic formulas for obtaining Area and Volume of specific geometric shapes and forms; commonly used units of Length, Area, Volume, Capacity, Mass in Metric measure and approximate U.S. equivalents; also a short table covering Temperature expressed in Celsius, Kelvin, Fahrenheit, as to absolute zero, freezing and boiling points of water, and body temperature; 5 pages.

Table 1 Formulas

Circle	$A = \pi r^2, C = 2\pi r$	Cube	$V = s^3$
Parallelogram	$A = bh$	Rectangular Box	$V = lwh$
Right Triangle	$A = \frac{1}{2}bh, c^2 = a^2 + b^2$	Cylinder	$V = \pi r^2 h$
Square	$A = s^2$	Pyramid	$V = \frac{1}{3}Bh$
Trapezoid	$A = \frac{1}{2}h(b + b')$	Cone	$V = \frac{1}{3}\pi r^2 h$
<hr/>		Sphere	$V = \frac{4}{3}\pi r^3$
Sphere	$A = 4\pi r^2$		

Table 2 Units of Measure

## Metric System and Approximate US Conversion Factors

Length	10 millimeters (mm) = 1 centimeter (cm) $\doteq 0.3937$ inch 100 centimeters = 1 meter (m) $\doteq 39.37$ inches 1000 meters = 1 kilometer (km) $\doteq 0.6$ mile astronomical unit 1 AU = $1.496 \times 10^{11}$ m wavelength-Ångström 1 Å = $10^{-10}$ m
Area	100 square millimeters (mm <sup>2</sup> ) = 1 square centimeter (cm <sup>2</sup> ) 100 square centimeters = 1 square decimeter (dm <sup>2</sup> )
	10,000 square meters = 1 hectare (ha) $\doteq 2.47$ acres
Volume	1000 cubic centimeters (cm <sup>3</sup> ) = 1 liter (l) = 1 cubic decimeter (dm <sup>3</sup> ) 1000 cubic decimeters = 1000 liters = 1 cubic meter (m <sup>3</sup> )
Capacity	1000 milliliters (ml) = 1 liter (l) $\doteq 1.1$ quart 1000 liters $\doteq 264.2$ gallons
Mass	1000 milligrams (mg) = 1 gram (g) $\doteq 0.035$ ounce 1000 grams = 1 kilogram (kg) $\doteq 2.2$ pounds 1000 kilograms = 1 tonne (t) $\doteq 2200$ pounds

## Temperature

	Celsius (°C)	Kelvin (°K)	Fahrenheit (°F)
absolute zero	-273.15	0	-459.67
freezing point of water	0	273.15	32
body temperature	37	310.15	98.6
boiling point of water	100	373.15	212

## METRIC SYSTEM - TABLES OF DATA

## 100.1.9

This table lists and illustrates the prefixes used in the metric system, specifically in respect to the gram unit; contains brief conversion tables for measures commonly used in U.S.; Rules for Converting from One System to Another; conversions for the apothecary ounce, grain, avoirdupois pound, fluid dram, fluid ounce, etc. 14 pages.

## UNITS OF LENGTH

Millimeters	Centimeters	Inches	Feet	Yards	Meters
1 mm. = 1.00	0.100	0.0394	0.00328	0.0011	0.0010
1 em. = 10.0	1.00	0.394	0.0328	0.0100	0.0100
1 μ = 1 mil = 1 micron = 0.001 millimeter. One mm. = 1000 μ.					
1 km. = 1 kilometer = 1000 meters = 0.6215 miles.					
1 mile = 5280 feet = 1.609 kilometers.					

1 cubic millimeter = 0.001 cubic centimeter; 1 cc. = 1000 cu. mm.

1 quart = 4 pints = 6 pinta = 8.78 liter.

## UNITS OF VOLUME

Cubic Centimeters	Fluid Dram	Cubic Inches	Fluid Ounces	Quart	Liters
1 cc. = 1.00	0.270	0.0610	0.0338	0.00106	0.00100
1 fl. g. = 3.70	1.000	0.226	0.1250	0.00391	0.00370
1 cu. in. = 15.39	4.43	1.000	0.354	0.0173	0.0163
1 fl. l. = 29.5	8.00	1.804	1.000	0.03125	0.03125
1 L. = 1000.	270.	57.75	32.00	1.000	1.000

1 cubic millimeter = 0.001 cubic centimeter; 1 cc. = 1000 cu. mm.

1 quart = 4 pints = 6 pinta = 8.78 liter.

## UNITS OF WEIGHT

Grains	Grams	Apothecary Ounces	Avoirdupois	Pounds	Kilograms	Grams	Grains	Grams	Fluid drams	Cu. in.	Fl. oz.	Quarts	Yards	Meters	Grains	Grams
1 γ. = 1.000	0.0648	0.00206	0.0001429	0.0000046	0.001000	10.000	164,323.6	1000.	0.270	0.0610	0.00338	0.001057	0.0100	1000.	164,323.6	
1 Gm. = 16.43	1.000	0.03216	0.002205	0.000046	0.001000	16.4323	164,323.6	1000.	0.226	0.0590	0.00325	0.001037	0.0254	1000.	164,323.6	
1 ʒ. = 480.	484.	14.66	1.000	0.454	0.1000	484.	164,323.6	1000.	0.1250	0.03125	0.001250	0.000391	0.0163	1000.	484.	
1 lb. = 7000.	484.	32.16	2.205	1.000	0.454	32.16	164,323.6	1000.	0.0554	0.015625	0.000325	0.001173	0.0163	1000.	484.	
1 Kg. = 16432.3	1000.			1.000	0.454		164,323.6	1000.	1.000	0.00325	0.000325	0.000325	0.000325	1.000	164,323.6	
				.0001	.0001										.0001	.0001

## UNITS OF WEIGHT

Grains	Grams	Apothecary Ounces	Avoirdupois	Pounds	Kilograms
1 γ. = 1.000	0.0648	0.00206	0.0001429	0.0000046	0.001000
1 Gm. = 16.43	1.000	0.03216	0.002205	0.000046	0.001000
1 ʒ. = 480.	484.	14.66	1.000	0.454	0.1000
1 lb. = 7000.	484.	32.16	2.205	1.000	0.454
1 Kg. = 16432.3	1000.			1.000	0.454

1 γ = 1 gamma = 1 milligram = 0.001 milligram; 1000 γ = 1 mg.  
 1 mg. = 1 milligram = 0.001 Gm.; 1000 mg. = 1 Gm.  
 1 gr. = 64.8 mg.; 1 mg. = 0.014 gr.  
 1 gr. = 164,323.6 mg.

To Convert Metric Fluid Measures  
To convert Metric fluid measures to minims: Divide by 16.  
Cubic centimeters to minims: Multiply by 16.  
Cubic centimeters to fluid ounces: Divide by 16.  
(or multiply by 0.0337).  
Liters to pints (U.S.): Multiply by 21.  
Liters to pinta (Imperial): Multiply by 21.

To Convert Centigrade Degrees to Fahrenheit Degrees  
Multiply the number of centigrade degrees by 9/5 and add 32 to the result.  
Example:  $60^{\circ}\text{C.} \times \frac{9}{5} + 32 = 60 + 32 = 92^{\circ}\text{F.}$

To convert Fahrenheit degrees to centigrade degrees: Subtract 32 from the number of centigrade degrees and multiply the difference by 5/9.  
Example:  $243^{\circ}\text{F.} - 32 = 211 \times \frac{5}{9} = 100^{\circ}\text{C.}$

## RULES FOR CONVERTING ONE SYSTEM TO ANOTHER

## To Convert Grain, Dram, and Ounce into Grams or G.C.:

To convert Metric fluid measures to minims: Divide by 16.  
Cubic centimeters to minims: Multiply by 16.  
Cubic centimeters to fluid ounces: Divide by 16.  
(or multiply by 0.0337).  
Liters to pints (U.S.): Multiply by 21.  
Liters to pinta (Imperial): Multiply by 21.

## To Convert Metric Fluid Measures

To convert Metric fluid measures to minims: Divide by 16.  
Cubic centimeters to minims: Multiply by 16.  
Cubic centimeters to fluid ounces: Divide by 16.  
(or multiply by 0.0337).  
Liters to pints (U.S.): Multiply by 21.  
Liters to pinta (Imperial): Multiply by 21.

## To Convert Centigrade Degrees to Fahrenheit Degrees

Multiply the number of centigrade degrees by 9/5 and add 32 to the result.  
Example:  $60^{\circ}\text{C.} \times \frac{9}{5} + 32 = 60 + 32 = 92^{\circ}\text{F.}$

## To Convert into Metric Fluid Measures

Minims to cubic millimeters: Multiply by 16.  
Fluid ounces to cubic centimeters: Multiply by 29.57.  
Fluid drams to cubic centimeters: Multiply by 37.32.  
Fluid ounces to fluid drams: Divide by 37.32.  
Fluid drams to fluid ounces: Multiply by 37.32.

## SIEVE OF ERATOSTHENES

### 100.2.1

Numbers 0 through 99 are shown in block form, ten down, ten across; non-prime numbers are "cancelled", i.e. circled or "sieved" out, explanatory note precedes table; 2 pages.

## SIEVE OF ERATOSTHENES

### 100.2.1A

Numbers 0 through 99 are shown in block form, ten down, ten across; prime numbers are indicated by being followed immediately with the letter "p"; explanatory note precedes table; 2 pages..

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99

## FRACTION, DECIMAL, AND PERCENT EQUIVALENTS

## 100)2.2

This is a conversion table in grid form; column headings are from 1 through 11; row headings are from 2 through 12, both at intervals of 1; column headings serve as numerators; row headings as denominators leading to decimal form of fraction and its percent equivalent; does not cover all fractions, but is a useful tool; 6 pages.

Denominator	Numerator										
	1	2	3	4	5	6	7	8	9	10	11
2	.50 50%										
3	.33 $\frac{1}{3}$ 33 $\frac{1}{3}\%$	.66 $\frac{2}{3}$ 66 $\frac{2}{3}\%$									
4	.25 25%	.50 50%	.75 75%								
5	.20 20%	.40 40%	.60 60%	.80 80%							
6	.16 $\frac{2}{3}$ 16 $\frac{2}{3}\%$	.33 $\frac{1}{3}$ 33 $\frac{1}{3}\%$	.50 50%	.66 $\frac{2}{3}$ 66 $\frac{2}{3}\%$	.83 $\frac{1}{3}$ 83 $\frac{1}{3}\%$						
8	.12 $\frac{1}{2}$ 12 $\frac{1}{2}\%$	.25 25%	.37 $\frac{1}{2}$ 37 $\frac{1}{2}\%$	.50 50%	.62 $\frac{1}{2}$ 62 $\frac{1}{2}\%$	.75 75%	.87 $\frac{1}{2}$ 87 $\frac{1}{2}\%$				
9	.11 $\frac{1}{3}$ 11 $\frac{1}{3}\%$	.22 $\frac{1}{3}$ 22 $\frac{1}{3}\%$	.33 $\frac{1}{3}$ 33 $\frac{1}{3}\%$	.44 $\frac{1}{3}$ 44 $\frac{1}{3}\%$	.55 $\frac{1}{3}$ 55 $\frac{1}{3}\%$	.66 $\frac{1}{3}$ 66 $\frac{1}{3}\%$	.77 $\frac{1}{3}$ 77 $\frac{1}{3}\%$	.88 $\frac{1}{3}$ 88 $\frac{1}{3}\%$			
10	.10 10%	.20 20%	.30 30%	.40 40%	.50 50%	.60 60%	.70 70%	.80 80%	.90 90%		
11	.09 $\frac{1}{11}$ 9 $\frac{1}{11}\%$	.18 $\frac{2}{11}$ 18 $\frac{2}{11}\%$	.27 $\frac{3}{11}$ 27 $\frac{3}{11}\%$	.36 $\frac{4}{11}$ 36 $\frac{4}{11}\%$	.45 $\frac{5}{11}$ 45 $\frac{5}{11}\%$	.54 $\frac{6}{11}$ 54 $\frac{6}{11}\%$	.63 $\frac{7}{11}$ 63 $\frac{7}{11}\%$	.72 $\frac{8}{11}$ 72 $\frac{8}{11}\%$	.81 $\frac{9}{11}$ 81 $\frac{9}{11}\%$	.90 $\frac{10}{11}$ 90 $\frac{10}{11}\%$	
12	.08 $\frac{1}{3}$ 8 $\frac{1}{3}\%$	.16 $\frac{2}{3}$ 16 $\frac{2}{3}\%$	.25 25%	.33 $\frac{1}{3}$ 33 $\frac{1}{3}\%$	.41 $\frac{2}{3}$ 41 $\frac{2}{3}\%$	.50 50%	.58 $\frac{4}{3}$ 58 $\frac{4}{3}\%$	.66 $\frac{5}{3}$ 66 $\frac{5}{3}\%$	.75 75%	.83 $\frac{7}{3}$ 83 $\frac{7}{3}\%$	.91 $\frac{8}{3}$ 91 $\frac{8}{3}\%$

## MULTIPLICATION TABLE

## 100.3.1

Row headings and column headings range from 1 through 12 at intervals of 1; products are exact; 1 page.

MULTIPLICATION TABLE

	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

## PI TO 5000 PLACES

100.3.2

Value of Pi is tabulated to 5000 decimal places; instructions for reading the table are included; 9 pages.

$$P_1 = 3.4$$

1415926535	8779323846	2634383279	5028P#1971	6939937510	5820976944	592307168	0622620899	8628034825	3421170679
8214808651	3282306647	0938466695	5058223172	5359408128	4811174502	8410270193	8521105559	6464229849	5493038196
6428810975	6565933461	2847564823	3786783165	2712190901	4564856692	3403684160	4543266482	1339360726	0249141273
7245870066	63631558817	4881520290	9628292590	14751563636	7892593060	11230503505	1384166951	9511160989	
1303572036	5759591953	0921861173	8193261179	3105118584	7846423799	627495735	1865752722	18912279381	8301199192
98336373362	4406566630	0602139496	6395227373	1907C21798	60946370277	6359217176	2931767523	8467841846	7694659132
0005601271	6524536082	7785771342	7757796901	31363717072	1464060901	7295363031	6549585357	1050792279	6892558923
4201995611	2129021960	E640344181	5981362977	4771309960	5107072113	4999999837	2978049951	0597317328	1609631859
5024459455	346980326	4252230825	3344685035	2619111881	7101000313	7838752886	5875332083	8142061717	7696147303
59825334904	2875546873	1159562063	8823537875	9351957788	1857785323	1712268066	1300192787	6611195099	2164201989
3809525720	1065485863	2786569361	5338182796	8230301952	0353018529	6099577362	2599413891	2497217752	8347913151
557485724	4541506959	5082935311	6861727055	8890750983	8175463746	4939319255	0604009277	167113900	9488280012
8583416035	6370766010	4710181942	955561989	6761787374	9482553379	77626871	0404753466	6208046684	2590696912
9331367702	8898152104	7521620569	6602405803	0150193511	2533024300	3558764024	7496473263	9141992726	0426992279
6782355741	6360093417	2164121992	4586315030	20616229745	5576747483	8505494582	5869269956	9092721079	7579302955
3211653494	8720275596	0236460665	991199810	3479775356	6369807262	5252786265	518181757	4672890977	7727938000
816760001	6165249192	1732172147	7235014144	1973568584	1613611573	5255213347	5718489468	4385232339	0739414333
5457762116	0625189835	6985562609	921922184	275520552	5686707179	0496160513	6680498864	2723279178	6085784383
8279679768	8145410095	3803786360	9506800642	2512520511	7392984896	0841284886	269564024	1965285022	21066111863
0674627862	2039198495	0471273137	0969695636	371917207	6677646575	739241389	0858532645	9958133904	7802759009
9465764078	9512694683	9835259570	9825022620	2244894077	267197486	8482601476	9909026401	3639463745	5305068203
9462524517	4399965143	1429809190	6592509372	2169426151	5079858387	41059782859	59772957459	8930161753	92886181382
6868386894	2776155591	8559252459	5395943104	9972524680	8459872736	446958865	3836736222	6260991246	0805124388
4390451244	1365497627	0870771569	1343997700	1296160659	1169486855	5848604355	4220722258	2848868185	84656280520
0168427394	5226747677	H895252138	522549956	6672782392	6545696116	3548862305	775649803	5593631568	1743241125
1507066974	9451096536	6940252280	7071099314	5669136867	2287489050	6010150330	8617928680	9208747609	1782493858
9009714909	6759852613	6556978189	3129784821	6289989987	2560058085	7560180270	4775551323	7964141552	3746233466
54285d4447	9526586182	1511141354	7357195231	1562716610	2135969536	314429520	8493718711	0145765043	5902799344
0378200731	5078519052	1913074747	0074884660	3521445713	8687519435	063021845	3191048481	0055706146	867491927
819119739	9520614196	634287544	063745123	1781521799	9839101591	956181673	426912937	4694909718	849231961

This table is transcribed in English Braille.

## METRIC CONVERSION TABLES

### 100.6.1

Table gives the prefixes (Divisions) and Multiples for base units in the metric system; the base units for linear, weight and capacity, as employed in table; also Cooking Measure Equivalents for certain recipe ingredients; short conversion table to metric equivalents; an oven temperature guide, converting Fahrenheit to Celsius; 4 pages.

METER - the base unit of linear measure

GRAM--the base unit of weight measure

LITER - the base unit of capacity measure

#### PREFIXES for base units

<i>Divisions:</i>	Deci = 1/10 Centi = 1/100 Milli = 1/1000	(0.1) (0.01) (0.001)	<i>Multiples:</i>	Deca = 10 times Hecto = 100 times Kilo = 1000 times
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#### COOKING MEASURE EQUIVALENTS

<i>Metric cup</i>	<i>Volume (liquid)</i>	<i>Liquid Solids (butter)</i>	<i>Fine Powder (flour)</i>	<i>Granular (sugar)</i>	<i>Grain (rice)</i>
		213 g	149 g	202 g	160 g
3/4	188 ml	160 g	112 g	152 g	120 g
2/3	167 ml	142 g	99 g	135 g	106 g
1/2	125 ml	107 g	75 g	101 g	80 g
1/3	83 ml				53 g
1/4	63 ml	53 g	37 g	51 g	
1/8	31 ml	27 g	19 g	25 g	20 g

	<i>Volume (liquid)</i>	<i>OVEN TEMPERATURE GUIDE</i>		<i>Ounces</i>
		<i>°F</i>	<i>°C</i>	
1 teaspoon	5 ml	225	110	1
1 tablespoon	15 ml	250	130	2
1 pint	1/2 liter			3
1 quart	1 1/8 liters	300	150	4
1 gallon	4 1/2 liters	325	170	5
		350	180	6
				170 ml
		375	190	7
		400	200	8
		425	220	9
		450	230	10
		475	240	11
				198 ml
				226 ml
				255 ml
				311 ml
				340 ml
				368 ml
				396 ml
				428 ml
				456 ml

For the most part, this table is transcribed in English Braille.

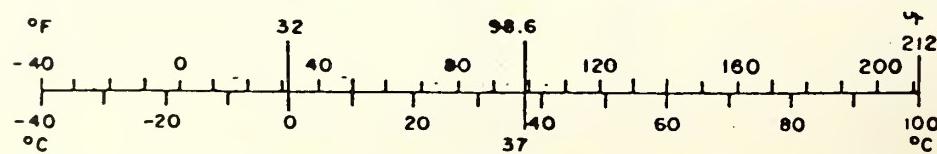
### METRIC CONVERSION FACTORS

#### 100.6.2

Approximate Metric equivalents for commonly used U.S. units in Length, Area, Mass, Volume, Temperature; 4 pages.

### Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
<b>LENGTH</b>				
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
<b>AREA</b>				
in <sup>2</sup>	square inches	6.5	square centimeters	cm <sup>2</sup>
ft <sup>2</sup>	square feet	0.09	square meters	m <sup>2</sup>
mi <sup>2</sup>	square miles	2.6	square kilometers	km <sup>2</sup>
	acres	0.4	hectares	ha
<b>MASS (weight)</b>				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
<b>VOLUME</b>				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft <sup>3</sup>	cubic feet	0.03	cubic meters	m <sup>3</sup>
yd <sup>3</sup>	cubic yards	0.76	cubic meters	m <sup>3</sup>
<b>TEMPERATURE (exact)</b>				
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C



\*1 in = 2.54 cm (exactly).

This table is transcribed in English Braille.

**FOOD AND NUTRITION BOARD, NATIONAL ACADEMY OF SCIENCES—NATIONAL RESEARCH COUNCIL RECOMMENDED  
DAILY DIETARY ALLOWANCES, REVISED 1973**

**100.6.3**

This table tabulates the recommended daily dietary allowances required for the maintenance of good nutrition of healthy people in the U.S., from Infants of 0.0 years to 0.5 years, 0.5 years to 1 year through Children of 1 to 3 years, 4 to 6 years, 7 to 10 years; Males and Females of 11 to 14 years, 15 to 18 years, 19 to 22 years, 23 to 50 years, 50 + years; column headings are: Weight, Height, Calories, Protein, Vitamins, Minerals; Vitamins, Minerals; 11 pages.

Designed for the maintenance of good nutrition of practically all healthy people in the U.S.A.

	Fat-Soluble Vitamins										Water-Soluble Vitamins										Minerals				
	Vitamin A Activity <sup>1</sup>	Vitamin D Activity <sup>1</sup>	Vitamin E Activity <sup>2</sup>	Vitamin K (IU)	Vitamin K (IU)	Ascorbic Acid Vitamin C (mg)	Folic Acid Vitamin B <sub>12</sub> (mg)	Niacin <sup>3</sup> Riboflavin (mg)	Thiamin Vitamin B <sub>1</sub> (mg)	Pantothenic Acid Vitamin B <sub>5</sub> (mg)	Vitamin B <sub>6</sub> Pyridoxine (mg)	Calcium Phosphorus (mg)	Chloride Sulfate (mg)	Iron (mg)	Iodine (μg)	Magnesium (mg)	Zinc (mg)								
<b>INFANTS</b>	0.0-0.5 0.5-1.0	6 14 9 20	60 24 71 28	kg x 117 kg x 108	kg x 2.2 kg x 2.0	420 <sup>4</sup> 400	1400 2000	400 5	35 35	50 50	5 8	0.4 0.6	0.3 0.5	0.3 0.4	0.3 0.3	360 540	240 400	35 45	10 15	60 70	3 5				
<b>CHILDREN</b>	1-3 4-6 7-10	13 28 20 44 30 66	86 34 110 44 135 54	1300 1800 2400	23 30 36	400 500 700	2000 2500 3300	400 400 400	40 40 40	100 200 300	9 12 16	0.8 1.1 1.2	0.7 0.9 1.2	0.6 0.9 1.2	1.0 1.5 2.0	800 800 800	800 800 110	60 80 10	15 200 200	10 10 10					
<b>MALES</b>	11-14 15-18 19-22 23-50 51+	44 97 61 134 67 147 70 154 70 154	158 63 172 69 172 69 172 69 172 69	2800 3000 3000 2700 2400	44 54 54 56 56	1000 1000 1000 1000 1000	5000 5000 5000 5000 5000	400 400 400 400 400	12 15 15 — —	45 45 45 15 15	400 400 400 400 400	18 20 20 18 16	1.5 1.8 1.8 1.6 1.5	1.4 1.5 1.5 2.0 2.0	1.6 1.8 2.0 2.0 2.0	1.200 1200 1200 800 800	1200 1200 1200 800 800	130 150 140 130 110	18 18 10 10 10	350 400 350 350 350	15 15 15 15 15				
<b>FEMALES</b>	11-14 15-18 19-22 23-50	44 97 54 119 58 128 58 128	155 62 162 65 162 65 162 65	2400 2100 2100 2000	44 48 46 46	800 800 800 800	4000 4000 4000 4000	400 400 400 400	10 11 12 13	45 45 45 45	400 400 400 400	16 14 14 12	1.3 1.4 1.4 1.2	1.2 1.1 1.1 1.0	1.6 2.0 2.0 2.0	1200 1200 1200 800	1200 1200 1200 800	115 115 115 100	18 18 18 18	300 300 300 300	15 15 15 15				





